GENERAL LIBRARY
UNIV. OF MICH.
NOV 14 1902

BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL

Vol. XIII.—No. 140.] BALTIMORE, NOVEMBER, 1902. [Price, 15 Cents.

CONTENTS.

	PAGE
Actinomycosis Hominis in America, with Report of Six Cases. By William G. Erving, M. D.,	261
Report of Two Testicular Teratomata with a Review of the Recent Literature. By H. W. Carey, M. D.,	268
Correspondence,	279
Notes on New Books,	281
Books Received,	281

ACTINOMYCOSIS HOMINIS IN AMERICA, WITH REPORT OF SIX CASES.[1]

William G. Erving, M. D.

The first cases of actinomycosis hominis to be noted in America were those reported by Murphy of Chicago in 1885. Seven years previously the articles of Bollinger, Harz, and Israel, appearing in Germany, had definitely established the relationship of the disease in animals and man to its cause—the streptothrix actinomycotica, or ray fungus.

In the years subsequent to the appearance of Murphy's article, numerous cases of the disease were reported from various parts of this country, until, in 1899, Dr. John Ruhräh of Baltimore was able to present a collection of 58 cases, many of which were then published for the first time.

In this most thorough discussion of the subject, the results obtained from a compilation of these American cases were compared with those of several hundred cases collected in Europe by Moosbrugger, Sokolow, Guder, Poncet and Bérard, and others, to bring out many valuable facts regarding the disease and its treatment.

To this collection Ruhräh subsequently added 4 cases as addenda, and seven others in a supplementary report appearing in 1900, thus including all the cases appearing in the American medical literature to November, 1899.

Since the publication of Ruhräh's article, cases have been more frequently reported, 25 appearing in the current American literature from November, 1899, to December, 1901, inclusive.

In addition to these, five cases occurring in the wards of the Johns Hopkins Hospital and a sixth in those of the Union Protestant Infirmary of Baltimore are now reported for the first time, making a total of 100 American cases.

Of the five cases observed in this hospital—all of which have occurred within the past three years—the disease was primary in the cervico-facial region in one, in the thoracic region in a second, and in the abdominal region in the remaining three. One of the abdominal cases died and one recovered, while the other cases have not yet been discharged. The sixth case, where the disease was located in the abdominal region, terminated fatally.

Following are the chief points in the clinical histories of each:

Case No. 1.—A. B., male, black, 17 years old, a rivet cleaner, from Hampton, Va.

He entered the hospital September 24, 1901, complaining of pain in the right side of face.

There was nothing of importance in his family or personal history, nor any history of infection. Eight months previous he first noticed stiffness of the lower jaw and swelling in front of and below the right ear.

This swelling increased slowly, became painful, and in April he was operated on at the Hampton hospital, and the pain was relieved, but discharging sinuses persisted in the wound.

Examination showed a large swelling in the region of the

[1] Read before the Johns Hopkins Hospital Medical Society, June 2, 1902.

zygoma and under the ramus of the jaw, soft and tender, save below the ear where there was a hard mass. He was unable to separate his jaws. Numerous sinuses were present, containing typical "sulphur" granules, in which the ray fungus was demonstrated microscopically. The febrile response to the administration of tuberculin was somewhat suggestive, not typical.

For two months the patient's condition remained the same, new sinuses appearing at intervals and his temperature ranging from 99°-100° F., while blood examinations showed a moderate leucocytosis of 8-10,000. On November 16 Dr. Mitchell explored the region of the right lower jaw, which was found to be greatly thickened, due to the formation of spongy tissue beneath the periosteum. This was chiseled away to normal bone, the adjacent diseased soft parts and scar tissue were dissected out, and the wound was packed with iodoform gauze. The after-treatment consisted of irrigations, at first daily, then on alternate days, with weak bichloride of mercury solutions, and the draining of the wound with iodoform gauze, for which last, gauze soaked in a saturated solution of potassium iodide was substituted in January and continued three months. At the same time KI was administered internally in increasing doses, reaching a maximum of 50 grains t. i. d. The wound healed slowly until early in March, when but a single sinus remained. However, at intervals the right side of face would swell and the patient would suffer considerable pain. These conditions grew worse and in March a new sinus appeared under the ramus, admitting a probe a distance of 5 cm.

On March 27 Dr. Mitchell again explored the jaw, found that the new sinus extended nearly to the coronoid process, while, communicating with the old sinus in the region of the zygoma, was a pocket containing about 10 grams of pus. He removed the coronoid, part of the zygoma, and much of the ramus, and dissected away the granulation and scar tissue, this last permitting the jaws to be widely separated. The after treatment was similar to that following the first operation, and the wound is healing slowly, while the patient's general condition remains good.

Case No. 2.—J. B., male, white, unmarried, age 26 years; residence, Mt. Wolf (York Co.), Pennsylvania; occupation, farmer.

Entered the Johns Hopkins Hospital September 24, 1901, complaining of a discharging sinus in the chest.

His family and personal history was unimportant. In March, 1901, he began to suffer from fever and pain in the chest. His chest bulged and his heart was displaced. Was needled several times and finally pus was obtained in the left lower back. An incision was made and considerable pus was evacuated. There has been an intermittent discharge ever since.

One week before admission a red and tender swelling appeared on the left side of chest, outside and below nipple. This was opened a few days before admission, and a small amount of pus was evacuated. There had been considerable loss of weight in the past six months, largely regained of late.

Examination disclosed a red swollen area, a hand's breadth in diameter, its center in the left anterior axillary line, which was very tender on palpation. Pus escaped from a sinus admitting a probe as far as the rib. Below the angle of the left scapula in the seventh interspace was a sinus discharging pus freely. There was decided flattening and impaired motion of the left side of chest. Distinct flatness and absence of breath sounds and vocal fremitus were found over entire lower left chest.

On September 26 Dr. Follis excised the posterior sinus, removed 4 cm. of the 8th rib, and opened into a cavity 18 x 15 cm. which contained a large amount of thick yellow pus. In this a branching bacillus was found, which did not grow upon ordinary media. The cavity was packed with iodoform gauze and a drainage tube inserted. The abscess over the same rib anteriorly was also opened and curetted out. There was seemingly a communication between the two cavities.

For two months the patient's condition was improved but a copious discharge continued.

About the middle of November a swelling 6 x 8 cm. appeared outside and below the anterior wound, painful and tender, and presently fluctuating. On November 25 Dr. Follis incised this, evacuated some pus, curetted and swabbed with carbolic the soft parts and the other sinuses, removed a portion of the involved rib, spongy in character, and irrigated the posterior cavity with salt solution.

In the pus were found typical "sulphur" granules, containing the ray fungus.

KI was administered internally in increasing doses to 30 grains t. i. d.

The patient's condition improved, his temperature remained normal, the wounds slowly granulated up, and he was discharged on December 20, with orders to continue the KI treatment and to return in two months if the sinuses persisted.

On February 4 he returned. In the middle of January the sinuses had closed and 10 days later a swelling appeared over the spot, associated with fever and chills. This was incised and foul-smelling pus escaped.

Examination showed left chest less prominent, respiratory movement less, tympany below 5th rib. All the sinuses were healed save one below the spine of scapula which discharged blood, no pus or granules being evident. It admitted a probe to a depth of 11 cm.

February 9 patient failed to react to tuberculin. The sinus showed a tendency to close, with damming back of the discharge, accompanied by fever, headache and malaise.

On February 18 Dr. Follis opened the left side of thorax, removing a large portion of three ribs, all diseased. Through this opening, equal to the diameter of the underlying cavity, the whole space was carefully curetted, much pus and

necrotic tissue were removed, and the cavity was swabbed with carbolic, and irrigated with salt. Aside from a febrile attack, yielding to quinine, improvement was uninterrupted, the wound healing rapidly. After three weeks discharge was slight and granules had disappeared. KI was continued throughout, up to 40 gr. t. i. d. A sinus has persisted in spite of swabbing with carbolic several times. It admits a probe a few centimeters. Otherwise the wound has healed.

Case. No. 3.—F. S. G., male, white, 31 years old, fireman, from Sparrows Point, Md. He entered the hospital April 25, 1899, complaining of swelling over right side of stomach.

Except for attack of typhoid fever 4 years previous, his history was unimportant.

In September, 1898, he had a severe attack of colic, lasting three days, without chills or fever. In March following he noticed tenderness in the right lower abdomen, and soon after swelling, accompanied by some pain, especially at the end of the day. No gastro-intestinal symptoms. Examination showed a tumor in the right inguinal region, parallel to Poupart's ligament, 10 x 7 cm. It was firm, smooth, reddened in center and somewhat tender, and apparently in the abdominal wall. Left inguinal glands were shot-like, and the right larger and soft near the swelling.

On April 28 Dr. Finney incised the tumor, and opened into a superficial abscess in the abdominal wall. Considerable pus was evacuated and in the numerous yellow granules which it contained, the ray fungus was demonstrated microscopically. The abscess was curetted and drained with iodoform gauze. The patient's temperature was very irregular until May 4, reaching 106.6°; the leucocytes, 12,000.

On May 20, the wound had almost entirely healed from the bottom, the patient's condition was excellent, and he was discharged.

On October 20, 1899, he re-entered the hospital. After his discharge he had gone to Philadelphia, but in a few days had grown rapidly worse, and since then had been under treatment at different hospitals in that city.

He had lost much in weight and strength, and could not stand erect without pain. He limped on walking and inclined body toward affected side. A sinus persisted in the old wound, discharging thick, yellow, offensive pus.

On November 3 Dr. Finney again operated, excising the old granulating wound. A cavity was exposed from which three sinuses led. The first passed beneath Poupart's ligament, opening into a large cavity in the hollow of the ileum, which was roughened and eroded. The second burrowed deep under the femoral vessels; while the third extended to the cæcum and entered its lumen. All these were lined with granulation tissue and stringy yellow necrotic tissue, while sulphur granules were present in great numbers. The muscular abdominal walls were much weakened and showed fibrous changes.

The sinuses were all curetted out, the perforation of the cæcum closed, the adjacent lymph glands removed, and the wound was packed with iodoform gauze.

The after-treatment consisted of irrigations of potassium iodide, 20 and later 40 parts to the 1000, until March, when bichloride, 1-50,000 was substituted. The sinuses were packed with bizmuth gauze. Daily dressings until April; then every other day. Granules plentiful in discharge until March and never entirely absent. Internally KI was administered in increasing doses to 100 grains t. i. d., which was continued 4 months. The patient's condition improved. On April 26, 1900, the inner sinus measured 8 cm. in depth, the outer 18 cm. and they communicated. Rubber catheters were employed as drains; considerable discharge. Patient had been up and about the ward for a month and suffered no pain. On this date he was discharged at his own request.

On May 30, 1900, he was again admitted. Ten days before a lump had appeared above the great trochanter of the right femur, and was associated with a dull aching pain. The tumor now measured 5.5 cm. in diameter, was freely movable and slightly tender. From the old sinuses was a profuse discharge containing granules.

On June 2 Dr. Cushing incised this tumor and opened into a cavity communicating with the intra-iliac cavity via the middle portion of the iliac crest. A button of ileum was removed to make communication more direct. The old sinuses and the cavities were curetted out, swabbed with carbolic, and packed and drained with iodoform gauze. The treatment used on previous occasion was resumed.

About this time a lump appeared in right back, near the lumbar vertebræ. This grew to 4 cm. in diameter and was red, tender, and fluctuating.

On July 21 Dr. Mitchell incised this, evacuated several ounces of pus and many granules, and found a communication with old sinus over iliac crest. Cavity and sinus were irrigated and curetted.

On September 4 patient was discharged, two sinuses remaining, one from above iliac crest behind, to middle of Poupart's ligament, open at both ends, the other in back, 7.5 cm. deep. Slight discharge, no granules.

On May 20, 1901, patient reported. Had worked in Washington as fireman since discharge. Health excellent, weight increased from 148 to 170 pounds. Two small sinuses, one anterior, one posterior, persisted; slight discharge; no granules.

Case No. 4.—L. R., female, age 43, from Martinsburg, W. Va., white, manager of telephone office, unmarried. Entered hospital November 18, 1901, complaining of pain in right side. Family and personal history were negative.

In July, 1901, on three successive nights, she had been seized with sudden severe pain in right side, not radiating, becoming dull and heavy. This was followed by an illness confining her to bed three weeks, and at home three months. This was characterized by swelling over region of stomach, at times pain in right side radiating to groin and right breast,

while the right leg became almost paralyzed. There was no diarrhœa or blood in stools. Right side remained sore.

Four weeks preceding admission there was an exacerbation of the symptoms increasing in severity. Her appetite is poor, bowels irregular; she has lost weight, and has slight fever. Walking erect is painful. Sometimes she has trouble in voiding urine. One menstruation since March. No jaundice, sweats or chills.

General examination was negative. The abdomen was found full below umbilicus, depressed above, the abdominal respiratory movements very slight. The abdomen was tympanitic except in right flank, which was not so full as left, and was very tender on deep palpation, especially under ribs. The abdominal muscles were held firmly, without spasm, and on right side were almost board-like.

November 20, leucocytes 24,400.

November 22, leucocytes 36,200.

On November 22 Dr. Halsted explored the region about the liver and the right kidney. An area of necrotic tissue was found about tip of liver, from which B. coli communis was cultivated. Pain ceased after the operation. In the first dressing some suspicious granules were found. Wound was partly closed and drained.

On December 4 temperature rose to 101.7°, abdomen became full and tender 8-10 cm. beyond edge of sinus in old wound, and the discharge increased. No chill.

On December 19 Dr. Halsted carefully explored the right kidney, stripping off the fatty capsule. Kidney was small, hard, and flat. About the tip of liver pus was again found, its origin not determined. Considerable discharge followed at first and by February 10 only a small sinus remained in upper part of wound, admitting probe 5½ cm.

At this time pain developed in hypocostal region and on February 20 a new sinus appeared above the first, containing "sulphur" granules, in which the ray fungus was demonstrated. The patient did not react to tuberculin. She also did not tolerate KI, the administration of which was abandoned after one week. Discharge continued to be profuse and many granules therein.

On May 16 Dr. Halsted again operated, entering first abdominally, and then through the lower thoracic wall opposite some hepato-diaphragmatic adhesions, removing portions of two ribs. Between the diaphragm and liver was found a pocket of necrotic material connecting with the sinus in the right flank. This was curetted and drained. Improvement has been positive but very slow.

Case No. 5.—R. W. M., male, aged 43, from Lance, Stafford County, Va., white, occupation farmer, unmarried. He entered the hospital April 11, 1901, complaining of pain in right side.

His family and personal history were unimportant. In October, 1900, he suffered from attack of cramps in right side without accompanying symptoms, lasting two days. Pain was extreme and required morphia.

March 4, 1901, he caught heavy cold at Washington. Cough disappeared a few days later but pain in side returned and persisted. This pain was sharp and sticking, localized just above and to right of umbilicus, more severe at night and on lying down. Of increasing severity week preceding admission. No fever, chills, jaundice or diarrhœa. Had lost 20 pounds since onset, and on April 27 weighed 129½. On examination right costal margin found much more prominent than left, though respiratory excursion on two sides was equal and the lungs were negative. On palpation there was found a mass extending downward 13 cm. and with a sharply marked edge 3 cm. below costal margin. The individual costal cartilages were not palpable, overlying skin was œdematous and infiltrated. Mass extended beyond median line, was very tender and there was marked rigidity of muscles of right epigastrium. On percussion it was flat, merging above into liver dulness.

After admission temperature was irregular, never above 100.5° and reaching normal only seven days after operation. The urine contained occasional casts and a trace of albumin at first, then became normal.

A blood examination on April 20 showed: R. B. C. 3,800,000, hæm. 70 per cent, and leuc. 10,000.

On May 7, the day of operation, the leucocytes had risen to 21,000. During this time the tumor had increased considerably in size.

On May 7, under ether, Dr. Mitchell entered the abdominal cavity in the right upper quadrant. An abscess cavity was opened into, which contained thin yellow pus, full of typical yellow granules, in which the ray fungus was demonstrated microscopically, and from which there was a slight growth of colonies of actinomycosis in five weeks. The wall of the cavity was formed of necrotic omentum and liver, large masses of the latter being curetted out without reaching normal liver tissue. Iodoform gauze was used to pack wound. One month later patient was about ward. Discharge was very slight and no granules found.

On June 14, 53 days after admission patient was discharged at his own request. His weight was but 110½, but his condition was very good. Wound was apparently healing well and from base, and no granules were present. Shortly after returning home condition grew worse, the wound broke down, he suffered much pain in the abdominal region, rapidly lost weight and strength, and died August 22. There was no autopsy.

Case No 6. (I am indebted to Dr. J. M. T. Finney for the following notes.)—C. H. G., a male, white, 46 years old, farmer, from Nut Bush, Warren County, North Carolina. He entered the Union Protestant Infirmary of Baltimore with symptoms of appendicitis. His past history was unimportant; there was nothing to lead to suspicion of infection with actinomycosis; he had had very little to do with cattle.

The attack resembled appendicitis with abscess formation and with that diagnosis he was brought to Baltimore for

treatment. At the operation, which was performed by Dr. Finney, an incision was made in the abdominal wall in the upper right inguinal region, and a large pus cavity was opened into. The pus was evacuated, the cavity packed and drained, and the patient subsequently left the hospital much improved.

He returned some time later with a recurrence of the symptoms and signs of an abscess cavity in the right renal region.

On April 17, 1900, Dr. Finney again operated, entering by an incision parallel to and below the costal margin. As in the previous instance a large abscess cavity was opened into, which had dissected its way along the outside of the ribs and into the flank, posterior to the mid-axillary line. Beyond this its course was not followed.

The contents consisted of a thin pus containing innumerable miliary granules of a yellowish color.

Because of its extent, complete excision of the abscess wall was impossible, but a considerable amount of infected tissue was removed, and the rest curetted. The cavity was then irrigated with bichloride of mercury, 1-1000, and packed and drained with iodoform gauze.

Microscopic examination of the infected tissue and the pus disclosed the presence of the ray fungus.

Potassium iodide in small doses was administered internally. The patient throughout had a temperature of from 99-101°, the wound healing but slowly, and on May 26 he again left the hospital improved. He returned home, where the disease later recurred and terminated fatally. No autopsy was obtained.

A study of these cases and of the 94 others reported by various American observers, makes possible several conclusions as to the nature of the disease, and suggests several lines of treatment, each having its more or less numerous supporters.

I. Distribution.—The cases are scattered widely throughout the country, although very naturally most of them are reported from the large medical centers. The residence of the patient is given in 96 cases. New York State furnishes 22; Illinois, 15; Massachusetts, 14; Iowa, 8; Maryland, 7; Pennsylvania, 5; Wisconsin, 4; California, Ohio, and Virginia, 3 each; Tennessee, Minnesota, and Alabama, 2 each; Colorado, Kansas, Kentucky, West Virginia, North Carolina, and Prince Edward's Island, 1 each.

It will be noted that less than 20 per cent of these come from southern states, which may account for the small number occurring in negroes, but three such cases being reported.

II. Sex.—72 were males, 23 females, while in 5 instances the sex was not mentioned. Leith, basing his results on 405 cases, gives 73 per cent males and 27 per cent females.

III. Age.—The youngest case reported was a child of 6 years, the oldest a man of 70. The disease occurs most frequently in middle life, as will be seen on arranging the cases according to decades—1-9 years, 1 case; 10-19, 9; 20-29, 16; 30-39, 19; 40-49, 12; 50-59, 9; 60-69, 6; 70, 1; age not stated, 26 cases. Thus in 47 of the 72 cases in which the age was stated, 64 per cent, the patients were from 20 to 49 years of age.

IV. Occupation.—This is mentioned in 66 instances. There was a wide range, but those occupations appearing most frequently were farmers, 13 cases; cattlemen, 5; school children, 5; housewives (2 of these lived on farms), 4; stablemen, 3; carpenters (one had associated much with animals), 3; merchants, 3; clerks, 3; laborers, 3; and physicians, 2. Thus in 24 cases, 36 per cent, the patients had had much to do with both livestock and grain.

V. Duration.—In one instance the disease continued but four weeks; in another, 13 years. In 14 the duration was 3 months or less; in 11, 3-6 months; in 18, 6 months to 1 year; in 15, 1-2 years; in 12, over 2 years; while in 28 cases this was not given.

The chronic character of the disease is well shown by the fact that in 44 cases, 62 per cent, it lasted over 6 months, and in 27, 37 per cent, over 1 year, though all the cases were under treatment to a greater or less extent.

VI. Infection.—Usually there is no definite history of infection. The disease, as occurring in man, is probably in a large majority of cases contracted from animals, especially cattle, in which actinomycosis, usually known under the name of "lumpy jaw" or "big jaw," is not uncommon; or in common with cattle, from grain.

In six of the cases there was a definite history of caring for an animal suffering from "lumpy jaw" during a considerable period preceding the manifestation of the disease in the patient.

In several cases, too, there was a history of habitually chewing grain or straws. The fact that the streptothrix actinomycotica habitually gains entrance to the human body by way of the mouth or the nose, sufficiently accounts for the large proportion of cervico-facial cases, 53 per cent, reported in this series.

In 18 of these cases (cervico-facial) the entrance of the organism could be located definitely in a carious tooth, a fragment of grain being found imbedded in the cavity in one instance; while in 3 others entrance was gained through a wound, caused in the different cases by a clamp for artificial teeth, a tooth-pick broken off beneath the tongue and not removed, and an oat straw in the same location. In still another instance the nucleus of an actinomycotic abscess in the submaxillary region was found to be the fragments of a beetle.

Of the 4 skin cases, there was an external wound in 2, while in a third the patient was accustomed to sleep in the stable straw, with his back and shoulders, the seat of the lesion, unprotected.

VII. Clinical Characteristics.—These vary greatly with the region of the body involved. In the cervico-facial and cutaneous, as well as in many of the thoracic and abdominal cases, which first show themselves in the subcutaneous tissue of the walls of these cavities, the first symptoms noticed are

pain and swelling. This pain is not often severe, and may be entirely absent.

The swelling gradually increases in size, the tissues become red, firm, and develop a board-like resistance, while outside this area is a zone of marked œdema. The center of the involved area after a longer or shorter interval becomes fluctuating, and there follows a spontaneous discharge of the contents of the actinomycotic abscess cavity. The contents are a thin, clear, syrupy fluid, containing occasional or innumerable bodies varying in size from a pin point to a large pin head, of a pearly-gray to yellowish-white color—the so-called "sulphur" granules.

The abscess contents having thus, by the formation of a sinus, succeeded in escaping from the cavity, whose walls of densely infiltrated connective tissue tended to form a constantly increasing barrier to the spread of the disease in other directions, continue to discharge.

At this stage infection by pyogenic organisms is prone to occur, and the discharge becomes purulent in its character. The sinus too usually becomes choked by an exuberant growth of granulation tissue, pus reaccumulates in the site of the old cavity, and presently escapes in its turn from some newly formed sinus, the process repeating itself indefinitely.

In actinomycotic cases high fever is not marked, the temperature of the patient usually running more or less irregularly between normal and 101° F.

Examination of the blood shows a leucocytosis, varying in the 7 cases reported (4 in this hospital) from 8000 to 36,200, and averaging 17,000.

Three cases in the Johns Hopkins Hospital, in which an injection of tuberculin was administered for diagnostic purposes, failed to give the febrile reaction characteristic of tuberculosis.

The cervico-facial cases are often mistaken at first for ordinary toothache, and teeth are thereupon extracted without relief. Trismus is a marked symptom, often being so severe as to necessitate a liquid diet. These cases, if uncomplicated, are unaccompanied by marked general symptoms.

In the thoracic forms the first symptoms are those of a bronchitis or pleurisy, the disease in 9 of the 20 thoracic cases seeming to confine itself chiefly to the pleural cavity and thoracic wall.

Later on the symptoms become more severe, especially in the bronchial cases, often presenting a picture typical of phthisis—irregular fever, sweats, chills, cough, purulent or blood-stained sputum, loss of strength and emaciation. Profuse hemorrhage from the lungs is, however, rare, only one case being reported, and the sputum is only occasionally blood-tinged. Contrary to the usual rule in tuberculosis of the lungs, the bases were involved primarily in 7 cases, the apices in but 3, of the 10 cases in which the location of the lesion was reported. On careful search the ray fungus can be found in the sputum.

The abdominal cases often resemble appendicitis, and the appendix and the cæcum are the parts of the intestinal tract most frequently involved primarily. In five cases they were definitely mentioned as being involved, and such was presumably the fact in several others.

The liver is also frequently affected, but apparently always secondarily to a lesion of the intestinal canal (5 cases) or the lungs (2 cases).

VIII. Diagnosis.—Notwithstanding the fact that many of the symptoms of actinomycosis are very characteristic of that disease, diagnosis should never be positive without the finding of the organism—the ray fungus.

This occurs in the sulphur granules of the abscess contents, or much less frequently in the walls of the cavity. In man all three characteristic elements are found, but the long branching threads and the coccus-like bodies are more often seen than the bulbous processes, and are sufficient for establishing a diagnosis.

The presence of bodies in the discharge resembling sulphur granules, observed macroscopically, is not sufficient for a diagnosis, as under the microscope these are frequently found to be clumps of bacteria, tuberculous débris, etc. The cultivation of the organism, which is an anaërobe, is attended with difficulty and growth is slow.

In the American cases the "sulphur" granules were almost invariably found, while the ray fungus was definitely stated to have been observed in 71 of the cases.

IX. Location.—As far as could be determined from the histories, the primary lesion occurred in the region of the cheek or upper jaw in 11 cases, in the lower jaw or neck in 42 cases, a total of 53 in the cervico-facial region; in 20 instances in the thoracic region, in 23 in the abdominal, while in 4 the disease appeared to be primary in the skin.

Illich (as quoted by Ruhräh), in a collection of 421 cases, gives the primary involvement as follows: of head and neck 55 per cent, pulmonary 15 per cent, abdominal 20 per cent, cutaneous 2.5 per cent, unknown 6 per cent.

X. Extension.—Although the progress of the disease is sluggish, extension is prone to follow, either by direct involvement of contiguous tissues, or by metastases, the blood current acting as the carrier.

The first is by far the most common, and is well illustrated by several cases.

Thus in the case reported by Fütterer the primary lesion was found at autopsy in the lower lobe of the right lung, the diaphragm and liver being involved in succession.

In Bullitt's pulmonary case the disease was found at autopsy to have extended along the sheaths of the psoas muscles, reaching the iliac fossa on one side.

In Keen's case (Ruhräh's Summary, No. 65) the disease, spreading from the subcutaneous tissue of the arm, eroded the axillary artery, an almost fatal hemorrhage resulting, while in Hudson and Flexner's case (Ruhräh, No. 59) the disease, which had commenced as a "running sore" over the right scapula, was found at autopsy to have involved both lungs.

In the pulmonary cases the pleuræ are involved sooner or later, the actinomycotic abscess tending to discharge on the surface by means of a sinus.

In 17 of the 20 thoracic cases the abscess contents reached the thoracic wall and discharged either spontaneously or through an incision. The ribs or vertebræ were involved secondarily in 9 of the thoracic cases, the ileum in one abdominal case, while in 11 of the cervico-facial cases there was bone involvement.

That the disease may reach other portions of the body by the blood current is also definitely proved.

Fütterer's case, above mentioned, furnishes a beautiful example of this, two actinomycotic nodules being found at autopsy at the base of the tricuspid heart valve.

There is no proof of extension of the disease by way of the lymphatic system and it probably does not occur, enlargement of the lymphatic glands, or other evidence of infection by that channel, being conspicuous by its absence.

XI. Prognosis.—Recovery occurred in 45 cases, improvement in 14; in 9 no improvement was noted or the case was lost sight of, while in 32 there was a fatal termination.

Ruhräh, reporting on the first 58 cases, gives the following percentages: Recovery, 29.29 per cent; improvement, 7.44 per cent; no improvement or case lost sight of, 17.42 per cent; and death, 47.24 per cent.

The prognosis depends largely on the location of the disease, the pulmonary cases showing the highest mortality, the cervico-facial the lowest:

	Cervico-facial.	Abdominal.	Skin.	Pulmonary.
Recovery	36—67.9%	5—21.7%	2—50%	2—10%
Improvement.....	7—13.2	5—21.7	..	2—10
No improvement or lost sight of.....	5— 9.4	3—13.0	..	1— 5
Death	5— 9.4	10—43.4	2—50	15—75
No. of cases	53	23	4	20

XII. Treatment.—43 cases were treated surgically, 23 by excision of the affected tissue, and 21 by simple free incision and curettage. Both methods were followed by irrigations, usually of bichloride of mercury in weak solutions, and by packing and drainage with iodoform gauze.

34 cases were treated surgically, 11 by excision, and 23 by incision and curettage, with after-treatment similar to the above, while iodide of potassium was definitely stated to have been used at the same time as an internal medicine.

In 9 cases potassium iodide was administered without surgical treatment.

In 1 of the 2 thoracic cases in which complete recovery occurred (Ruhräh, Case No. 33), oil of eucalyptus alone was used (both internally and as a spray). In one cervico-facial case and in one abdominal case, recovery followed injections of cinnamyl and muriate of cocaine, and zinc and silver nitrate respectively.

In 11 cases the treatment was not reported.

In a large proportion of the cases treated surgically, repeated operations were necessary before recovery occurred. The disease exhibited great stubbornness and recurred almost invariably after simple incision and drainage, and not infrequently after what was believed to be complete excision of the affected tissue.

Good results have followed in the cases in this hospital only after the latter treatment, though in 3 of the cases in connection with less complete operations potassium iodide had been administered previously in large doses and for long periods.

Sawyers of Iowa strongly recommends in addition to the internal administration of potassium iodide, its injection hypodermically into the affected tissues. He reports three cases treated in this way without operation, two of which, one a pulmonary case in which the ray fungus was demonstrated in the sputum, were followed by recovery, while a third, at the time of his report, was practically well.

His treatment consists in the injection of from 15 to 30 minims of a 1 per cent aqueous solution of potassium iodide at intervals of from 3 to 4 days at first, but later more infrequently. In one case 41 injections were administered, while in the pulmonary case 25 injections were made through the thoracic wall directly into the lung tissue. The only unpleasant effects noted were increased swelling and sometimes pain for a period of about 12 hours following the injection.

The data regarding the 43 cases in which potassium iodide has been used internally in the treatment of actinomycosis are very incomplete. In 4 cases it was certainly discontinued without a fair trial, while in the remainder the duration of the treatment is only infrequently given. The amounts also varied greatly, ranging from 15 to 600 grains daily.

Lieblein, of Wölfler's clinic, Prague, in an article on the subject appearing in "Beiträge für klinische Chirurgie," Vol. XXVIII, p. 198, gives the results of potassium iodide treatment in connection with surgical incision in 62 cases, in 49 of which the disease was located in the cervico-facial region. On comparing these with the 21 American cervico-facial cases in which potassium iodide is mentioned as part of the treatment, and the 32 in which *no* mention of it is made, it will be seen that his results are very similar to those of the latter class of American cases. Both are more satisfactory than the results of those American cases treated *with* the drug, which in 4 instances was not associated with any surgical procedures. Cervico-facial cases:

	No.	Recovered Cases.	Improved Cases.	Non-improved, includes L's cases still under treatment.	Died—Cases.
	1. Lieblein 49	36—73%	6—12%	4—8%	3— 6%
American	2. K. I. treat....21	12—57	5—24	1— 5	3—14
American	3. No K. I. treat..32	24—75	2— 6	4—13	2— 6
	4. (2 and 3 combined 53	36—67.9	7—13.2	5—9.4	5—9.4

The drug probably has no specific action on the ray fungus, as this has been found in the body tissues after months of systematic potassium iodide treatment.

Its use is generally recommended in connection with free incision and drainage of the actinomycotic abscesses as they

appear, when the best results are seen. The action of the potassium iodide, as stated by Lieblein, is to bring about a solution of the cellular infiltration about the abscess cavity, and the consequent discharge of the ray fungus, in imitation of nature's own method of healing.

Porter of Boston, in his report of 8 cases occurring in his own service, grants that the drug "has distinctly influenced some cases for good and should be used in connection with the local [surgical] treatment." He advises, notwithstanding, the complete excision of the affected tissues wherever possible, a conclusion much in accordance with that drawn from results obtained here.

References.

Basham, D. W., of Neal, Kansas: Western Med. Review, 1900, December 15. 1 case.

Bullitt, J. B., of Louisville, Ky.: Annals of Surgery, 1900, May. 1 case.

Fütterer, G., of Chicago: New York Med. Journal, 1901, August 24. 1 case.

Hudson, W. H., of Columbus, Ga.: Atlanta Journal-Record of Medicine, 1901, December. 1 case.

Munro, J. C., of Boston: Boston Med. & Surg. Journal, 1900, September 13. 4 cases.

Oliver, J. C., of Cincinnati: Annals of Surgery, 1900, November. 1 case.

Porter, C. A., of Boston: Boston Med. & Surg. Journal, 1900, September 13. 8 cases.

Ruhräh,[1] J., of Baltimore: Annals of Surgery, 1899, Vol. XXX. 62 cases.

Ruhräh,[1] J., of Baltimore: Annals of Surgery, 1900, Vol. XXXI. 7 cases.

Sawyers, J. L., of Centerville, Iowa: Journal of the Am. Med. Ass., 1901, May 11. 7 cases.

Van Der Veer, A., and Elting, A. W., of Albany, N. Y.: Medical Age, 1901, November 10. 1 case.

[1] These two last including all articles in literature to Nov. 1899.

REPORT OF TWO TESTICULAR TERATOMATA WITH A REVIEW OF THE RECENT LITERATURE.

By H. W. Carey, M. D.,

Instructor in Histology, Albany Medical School.

(From the Bender Hygienic Laboratory, Albany, N. Y.)

The problems which are to be solved in regard to the origin, development and structure of teratomata in general, and especially of those occurring in the ovary and testicle, have aroused a widespread interest among pathologists, as is shown by the rapidly increasing literature on this subject.

A brief review of the recent literature, therefore, seems pertinent, and at the same time we wish to report two cases of teratoma of the testicle.

Case I. *Clinical History.*—Patient 29 years old, married; occupation, porter.

Family history is negative.

Past History.—Has always enjoyed good health. No history of syphilis or other venereal disease.

Present Illness.—No history of trauma. Noticed a painless enlargement of the left testis, about six months previous to admission to the hospital, which increased in size, but was not accompanied by pain. Testis removed at operation on January 3, 1901. Recovery uninterrupted and patient was discharged in nine days. On April 13, 1902, the patient has just recovered from an attack of typhoid fever. There is no evidence of recurrence. No discoverable metastases.

Pathological Report.—The specimen consists of a globular tumor measuring 10½ x 9 x 7 cm., which represents an enlarged testicle. The epididymis and the vas deferens appear normal. The veins of the pampiniform plexus are slightly enlarged. The outer layer of the tunica vaginalis is somewhat thickened; its inner surface smooth. The visceral layer is also smooth, and contains numerous dilated veins. On section the testicular parenchyma is entirely displaced by a soft bulging new growth. The appearance of this varies in different parts. It seems to be made up for the most part of a series of small cysts, varying from 1-3 mm. in diameter, which are closely set together, and which are separated into groups by bands of connective tissue. In some places the amount of connective tissue is quite large. The tumor shows yellowish areas of necrosis and occasional areas of hemorrhage. The fluid which is contained in the cysts is clear and slightly mucilaginous. Besides the cysts there are small translucent grayish areas in the stroma, which have the appearance of hyaline cartilage.

Microscopic Examination.—At the margin of the tumor a few tubules of the testis are found, which appear normal. Immediately within these is a connective tissue capsule containing a few dilated capillaries.

For convenience the descriptions of the cysts and stroma are given separately.

The Cysts.—Are found scattered generally throughout the tumor, and in most instances have an epithelial lining, although this is occasionally absent. In outline they are very irregular, due in part to the uneven growth of the epithelial lining, in part to the character of the connective-tissue wall. The contents of the larger cysts have escaped, but in the smaller ones consist of albuminous material, degenerated epithelial cells, and in some instances polymorphonuclears. The epithelium lining the cysts varies from the flat squamous to the columnar type and may be of simple or stratified variety. The flat epithelium is confined mostly to the larger cysts where the cells seem drawn apart. Generally in single layer, they are stratified at rare intervals. The individual cells show a vacuo-

lated protoplasm containing a nucleus with indistinct chromatin network. Certain cysts contain epithelium which has undergone keratohyaline change, forming epithelial pearls, and leaving only a single layer of epithelial cells as a lining. Solid nests of epithelial cells are present, smaller than the above cysts. The peripheral cells are columnar and closely packed together, those toward the center become flattened, and finally undergo keratohyaline change. By the osmic acid method of Kolossow intercellular bridges can be distinctly demonstrated in these solid epithelial nests. Cysts containing both squamous and columnar epithelium can be found, and no definite line of demarcation between the two varieties of epithelium is apparent; the transition seems gradual. Pure columnar epithelium lining the cysts is rarely seen, nevertheless it is present. The variety is always simple or pseudo-stratified, and the peripheral protoplasm contains zymogen granules. No ciliated epithelium or goblet cells could be demonstrated. Irregular and tortuous clefts in the stroma lined by cuboidal or squamous epithelium occur here and there in the sections and resemble the cysts above described, with the exception of the very irregular outline. Small alveoli lined by simple columnar epithelium are present, and round about them the epithelial tissue has the appearance of having undergone carcinomatous change. The cells are closely packed together into irregular nests and seem to be invading the surrounding stroma in every direction. The nuclei in these areas are large, oval or round with distinct chromatin network and often appear vacuolated. The protoplasm is mostly degenerated, and the cell outline indistinct. A transition from the gland alveoli to these malignant epithelial nests is apparent in some places.

Stroma.—Connective tissue forms the predominant element and presents a variety of types. The most frequent is the ordinary white fibrous tissue with wavy fibres and elongated irregular nuclei. Where the tissue is very dense and the nuclei very closely arranged, it bears a striking resemblance to sarcomatous tissue. Myxomatous tissue with very loosely arranged fibres, and large nuclei with distinct nucleoli, is present, but in small amounts. Smooth muscle arranged in bundles running in all directions is found in all portions of the tumor. About the larger cysts the muscle forms a circular layer, but definite outer longitudinal and inner circular layers are not found. Cartilage exists in the form of small islands with circular outline, which are surrounded by connective tissue from which the cartilage appears to be developing. Only the hyaline variety is present. Adipose tissue is present in small amount. Lymphatic tissue occurs especially about the epithelial elements and cysts, but no definite corpuscles of Malpighii are found. The blood supply is poor. No well defined vessels are found, but here and there are spaces in the connective tissue containing blood corpuscles and resembling dilated capillaries. No elastic tissue could be demonstrated by Weigert's method.

In this tumor we have tissues derived from all three germinal layers. From the ectoderm the squamous epithelial nests with peripheral columnar shaped cells, which gradually flatten toward the center finally to undergo keratohyaline degeneration, and the cysts with squamous epithelial lining. The former represent the epidermis.

From the ectoderm, the gland alveoli with columnar epithelial lining and epithelial nests, which have the appearance of having undergone malignant change.

Microscopically it has every appearance of malignancy, and this fact, together with its general distribution throughout the tumor, lead us to believe, in spite of the fact that the subsequent history reveals no recurrent growth, that this represents a true carcinoma. The mesoderm is represented by the connective tissue, smooth muscle and the islands of cartilage. The tubules of the testis are normal; also the epididymis, vas deferens and veins, so that this malignant growth must spring from the elements of the tumor. Some cysts containing two types of epithelium were described. Gessner[1] explains these by a junction of two cysts, each having a different epithelial lining.

CASE II. No clinical history can be obtained.

Pathological Report.—The tumor consists of a mass with the general shape of the testicle measuring 9 x 7 x 7 cm. Its outer surface is smooth and covered by a double membrane, which represents the tunica vaginalis. The outer layer of the tunica is smooth and normal in appearance, both externally and internally. It contains a number of rather large veins. The inner layer of the tunica vaginalis forms the capsule of the tumor. It is slightly and uniformly thickened. Numerous large blood channels can be seen coursing through it. In places it is attached firmly to the tumor, in other places only loosely. The tumor differs in consistency in different parts; in some places it is solid, in others cystic. The epididymis is not apparent to the eye. On section the cut surface of the tumor is very irregular, contains circumscribed portions bulging above the general level and other depressed areas, which seemingly represent small cyst cavities. The elevated portions also seem to be thin walled cysts, containing a clear fluid, either watery or mucilaginous. Between the cysts, which vary in diameter from one to nine or ten millimeters, the tissue is of a homogeneous gray-white color. In this tissue a number of small cavities are present, some of which seem to be blood vessels, whilst others are perhaps small cysts. The portion of the tumor representing in position the epididymis presents a different appearance. It is apparently firmer than the rest of the tumor and of a mottled appearance, the predominating color being a reddish-brown, this appearance giving one the impression of being due to altered blood. The cord measures about 2 mm. in diameter, is uniform in size, not nodulated, and is pervious throughout. About one pole of the tumor there seems to be an area of normal testicular tissue. Microscopic examination of the fluid from the cysts shows epithelial cells which have undergone fatty degeneration, red blood corpuscles and small refractive bodies, which look like the heads of spermatozoa.

Microscopic Examination.—From the naked eye appearances and a comprehensive study of the sections we can divide the tumor into three parts, cysts, stroma, and the hemorrhagic portion corresponding in position to the margin of the tumor. The cysts as noted in the gross description vary greatly in size, and are simple in formation. The cyst contents have escaped. Epithelium showing wide variation in structure forms the cyst lining. The lining in the majority of the cysts is of the columnar type, and of the simple or pseudo-stratified variety. Cilia are noted in some instances. Goblet cells clothe the cysts in other instances, and here shallow infoldings are noted resembling simple tubular glands (anlage of the digestive tract). Offshoots from the cysts in the form of fine processes with epithelial lining suggest strongly that in some instances they communicate one with another. Squamous epithelium is not at all frequent. It was only once noted, but here was of typical appearance, and occurred in the form of a cellular island, the center of which contained an epithelial pearl. In only one place does the epithelium appear to have taken on malignant characteristics. This area is near the margin of the tumor, since alveoli testis border it, and is in the form of a nodule separated into compartments by trabeculæ of connective tissue. In these compartments are cells of peculiar

[1] Gessner, Deutsche Zeitschrift für Chirurgie, 1901, lx, 86–126.

appearance with cell outline indistinct, and protoplasm degenerated. The nuclei are very irregular in size and shape, in some cases almost completely filling the cell, in others small and crescent-shaped. At times the nuclei appear to exist alone without protoplasm. The arrangement of the cells is quite indefinite, except in a few places where true gland alveoli provided with columnar epithelium exist. A gradual transition from the normal appearing alveoli to the irregular cells above can be traced without difficulty. No mitotic figures were present. The stroma of this nodule is composed of fibrous connective tissue in which are found many lymphocytes and plasma cells. At one point on the margin of the tumor just inside the capsule we find a very peculiar tissue. What the distribution of this tissue is cannot be determined since it was not noted in the macroscopic description, but in all sections cut at the margin of the tumor it is constantly present. The arrangement of the tissue is in columns, which have apparently a tortuous course and enclose within their spaces masses of blood clot. The columns are very irregular in outline and vary in thickness, at times being only the width of one cell. The manner of growth is distinctly malignant in appearance, for it seems to be invading blood vessels in the neighborhood, pushing in the endothelium before it. It also is growing into the blood clot. It is attached to the compact connective tissue which is at the margin of the tumor, and extends along trabeculæ which run toward the center of the neoplasm. It also exists without supporting tissue as irregularly circular masses or finger-like processes. A study of the individual cells shows that we have two varieties to deal with. For a comparison of these we have taken an area where the tissue exists by itself without supporting stroma. The most noticeable thing is the fact that there is no stroma, the cells being closely packed together without apparent support. The smaller of the two varieties of cells have a fairly definite outline and are of an oval, circular, or quadrilateral shape. They are about the size of decidual cells. The protoplasm takes eosin well and is slightly granular. It shows a tendency to degenerate, being absent in some cells. The nuclei are oval or circular, fairly small in proportion to the size of the cell, and stain almost solidly so that no chromatin network can be seen. A few mitotic figures were noted in these cells. The larger cells are many times the size of the ones just described, and much more irregular in shape. They appear as mere masses of protoplasm in which are nuclei, no cell division being apparent. These protoplasmic masses are sometimes in long and very narrow strands. The protoplasm is quite granular and stains very deeply in eosin. In places it has degenerated, giving an areolar appearance to the tissue. The nuclei are large and very irregular in shape and size. They show a distinct chromatin network with one or two distinct nucleoli. Small oval masses of protoplasm containing many nuclei resemble giant cells. Occasionally single cells exist. Mitotic figures are numerous. Among these cells are found red blood corpuscles, but no blood vessels or stroma of any kind. The blood clots which this peculiar tissue surrounds present no unusual features, except that they contain more leucocytes than usual.

Stroma.—White fibrous connective tissue forms the basis and is arranged in the form of bundles running in and out between the cysts. In some areas it is compact, in others, definitely myxomatous. Smooth muscle is present in large amount, disposed in bundles running in all directions. In some areas the muscle forms a circular and longitudinal coat about the cysts. No cartilage, elastic tissue or bone is present. The epididymis has been the seat of hemorrhage but is otherwise unchanged the tubules appearing normal.

As derivatives of the entoderm we have in this tumor the cysts and spaces lined by columnar epithelium often ciliated and often containing goblet cells. The mesoderm is represented by the connective tissue and smooth muscle, which is often arranged in layers about the cysts. Cysts with infoldings of the lining epithelium, with submucosa, and surrounding layers of smooth muscle represent an anlage of the intestinal tract. The ectoderm has not developed to any extent as only one nodule was found containing squamous epithelium with a central epithelial pearl. The peculiar tissue at the margin of the tumor is confusing. The larger cells have all the characteristics of syncytial cells, and we believe this to be their true interpretation. The smaller cells are hard to explain; they seem quite distinct from the larger cells although placed in among them. They do not appear to be an early stage of syncytium, but have rather the appearance either of decidual cells or cells of Langerhans' layer. The arrangement of the syncytium-like cells into long strands, and their marked tendency to invade the surrounding blood vessels and blood clot, strongly suggest a malignant character. A comparison with sections from a true deciduoma malignum showed a striking resemblance between the two.

It must be remembered, however, that this tissue is confined to the margin of the tumor, that the epididymis, vas deferens and veins of the pampiniform plexus are normal, that it is necessarily developing within narrow confines which possibly tends to the development of invasive characters. Taking into consideration these facts, and with no clinical evidence of metastases, we feel that we cannot say positively that we are dealing with a malignant growth of syncytium, although this is the most plausible interpretation.

Since the appearance of Wilms'[2] articles, numerous teratomata of the testis have been reported, and from the literature we have collected twenty-four cases. A brief history of these cases is given.

CASE III. *Wilms.*—Patient 50 years old. History of injury to testicle 15 years previous, from which patient dates the beginning of the tumor. The tumor is entirely within the tunica albuginea. The spermatic cord and vas deferens are normal. On section numerous cysts are present, and small islands of cartilage are noted. Some of the cysts communicate one with another by means of canals.

Under the microscope the tumor tissue is seen to be composed of elements of all three germinal layers. The ectoderm is represented by cysts lined by squamous epithelium in which were also epithelial pearls. The mesoderm is represented by connective tissue, frequently of embryonic type cartilage, bone, smooth and striated muscle and lymphatic tissue. The entoderm by cysts lined by high cylindrical epithelium, which show glandular depressions in the form of offshoots from the main cyst which are lined by cuboidal epithelium. The close relationship between these cysts and the cartilage suggests a tracheal anlage. At the margin of the tumor is found a capsule of connective tissue, and beyond this again degenerated testicular canals.

CASE IV. Clinical history not given.

Tumor measures 13 x 8 cm., and is enveloped by tunica albuginea. The tumor can be divided into three parts, a central cystic portion, and a solid portion at each pole. The cystic

[2] Wilms, Beiträge zur Pathologischen Anatomie u. zur Allgemeinen Pathologie, 1896, xix, 233–366.

Deutsche Zeitschrift für Chirurgie, 1898, xlix, 1–25.

Teratoma of testicle, showing syncytial cells and cells of Langerhans layer invading blood space.

portion is supported by trabeculæ of connective tissue, in which are islands of cartilage. The cysts are connected one with another in some instances. The epididymis is normal.

On microscopic examination it is seen that the central cystic portion is constructed of tissue derived from the three primary germ layers. Cysts provided with columnar or cuboidal epithelium in simple or stratified variety, the individual cells showing now a granular protoplasm, now a distinctly mucous character, are very numerous, and are derived from the entoderm. The arrangement of such a cyst with submucosa and muscularis about it suggests an anlage of the digestive tract. Cysts provided with a lining of squamous epithelium, in the center of which epithelial pearls are often found, have their origin from the ectoderm. In the beginning of its growth the squamous epithelium is in the form of solid processes, and only later becomes cystic by degeneration of the central cells. The arrangement of the cells is the same as that found in the skin: the outermost cells corresponding to the stratum Malpighii gradually become flatter and keratinized finally to the epithelial pearl. These epithelial structures are supported by a stroma developed from mesoderm consisting of connective tissue of all varieties, cartilage and smooth muscle. Where the cell growth has been prolific the tissue resembles that found in sarcomata. The rapid growth of the whole tumor has led to considerable necrosis. Within the albuginea remains of testicular parenchyma are still to be made out.

CASE V. Diameter of tumor 10 cm. The cord and epididymis appear normal. The whole tumor is surrounded by the tunica albuginea and the tunica vaginalis. The main portion of the tumor is in the center of the testis, and at each pole there is one smaller nodule.

Microscopic Examination.—Degenerated testicular parenchyma is noted at the periphery of the tumor, especially at the poles. From the ectoderm are found canals and tubules, sometimes hollow and lined by squamous epithelium, sometimes solid with a central epithelial pearl. These structures are quite numerous in contradistinction to the cases above reported. From the entoderm the cysts lined by cylindrical epithelium are derived. The character of the epithelium is influenced much by the intracystic pressure, the cells being in some places flattened and separated. Many mucus-secreting cells are present, also a few gland alveoli. The occurrence of some cysts with a circular muscularis, lymph follicles, cartilage and glands is interpreted as an anlage of the respiratory tract. The stroma contains connective tissue of both mucous and white fibrous types, cartilage, and smooth muscle. The stroma is more abundant in the central tumor than in the polar nodules. In portions of the tumor the tissues bear a close resemblance to sarcoma and carcinoma. At the upper pole where the tissue appears sarcomatous the albuginea has been penetrated, and the epididymis involved. Whether this growth has originated from the interstitial tissue of the testicle or from the mesodermic elements of the teratoma cannot be determined.

CASE VI. Patient 27 years old.

The spermatic cord and epididymis are apparently normal. The albuginea and a variable amount of testicular parenchyma surround the tumor. A few small cysts are scattered throughout the tumor. In the stroma islands of cartilage often collected into groups are noted. The blood vessels appear especially numerous.

Microscopic.—The spaces lined by squamous epithelium in their early development are solid, a lumen later being formed by degeneration of the central cells. The strata Malpighii, granulosum, and corneum are distinct. In contrast to these are the cysts lined by high columnar non-ciliated epithelium, with definite submucosa and circular muscularis, evidently an intestinal anlage. Numerous glandular structures open into the cysts, but there has not been sufficient differentiation to admit of comparison to any organ. A loose embryonic connective tissue forms most of the stroma, in which are found many islands of hyaline cartilage. Smooth muscle, generally arranged in a circular manner about the epithelial cysts and tubules, is abundant. The blood vessels, which as above noted are very numerous, have not reached any mature development, and are still embryonic. On the border of the tumor are found true testicular canals which have been much compressed by the growth of the tumor, and in some places simulate a definite capsule. Between the testicular canals the interstitial cells of Leydig have undergone proliferation. The growth of this tumor was very rapid, reaching the size of a child's head in ten months.

CASE VII. Tumor measures 15 x 7 x 10 cm. Vas deferens widened but otherwise normal. In the course of the pampiniform plexus nodules of tumor can be traced, which on section have a cystic structure. The epididymis is present, but its relation to the testicle is no longer clear. The tumor can be divided into three distinct nodules. The uppermost is hard and apparently free of cysts, but contains fine canals which look like blood vessels. The rete testis is not sharply separated from this nodule. The middle nodule shows cysts, canals and a stroma containing islands of cartilage. The lowermost nodule contains many cysts and canals, and is separated from the nodule above by a capsule.

Microscopic.—Only a small amount of testicular tissue remains and this is much degenerated. Tissues developed from all three germinal layers are present. Cylinders filled with squamous epithelial cells arranged in layers corresponding to those found in the epidermis. Cysts lined by cylindrical epithelium communicate one with another; glandular structures open into them. Mucous cells are abundant. Some of these cysts are in close relationship with smooth muscle and cartilage representing an anlage of the respiratory tract. Smooth muscle, cartilage, and several forms of connective tissue form the stroma. The nodules above described have the same elements, but the upper one is in an earlier stage of development. The nodules in the veins of the pampiniform plexus show a structure derived from the three germinal layers.

CASE VIII. No clinical history given.

Tumor measures 12 x 8 x 8 cm. Surface smooth and covered by tunica vaginalis and tunica albuginea. One vein of the cord is distended with a tumor nodule. The epididymis is somewhat compressed by the tumor, but its canals appear normal. The tumor is compact, and on section is composed of an aggregation of small nodules, some of which are solid, some cystic. In the cystic portions the interstitial tissue contains islands of hyaline cartilage.

Microscopic.—Canals of the testes are found only by study with the microscope, and are located here and there within the capsule. Their epithelial structures are much degenerated. In the more compact nodules the elements of the mesoderm preponderate, connective tissue, cartilage and smooth muscle. In the cystic portion the connective tissue is myxomatous in character. The cysts are lined by cylindrical epithelium, sometimes of single, sometimes of stratified variety, and contain many mucous secreting cells. Processes resembling gland alveoli open into the cysts in places, their functional characteristics, however, cannot be determined because of their early stage of development. The epithelium has grown into the con-

nective tissue in such a way as to suggest carcinoma. These cysts are in close relationship with the smooth muscle and cartilage as described in the above cases. Squamous epithelium possessing the characteristic arrangement of the epidermis is found in small amount lining cysts, or in the form of solid cylinders. The tumor nodule in the vein mentioned has not the characters of the teratoma, but is a round-celled sarcoma.

CASE IX. Patient aged 43. Noticed a tumor nodule in testis the size of a hazelnut, which in nine months attained the size 10 x 7 cm. The tumor has developed within the substance of the testicle as is proven by the covering of tunica albuginea, or where this has been removed in a previous examination by true testicular parenchyma. In places the tumor is fluctuating, and on section many spaces and cysts are found. The contents of the cysts are in some cases atheromatous, in others colloid-like. Pressure of growth has influenced the shape of the cysts, and the walls of some have been broken through. Communication between cysts is noticed in some instances. The stroma is small in amount, cartilage is rare, and the blood vessels not well developed.

Microscopic.—What remains of the testicle at the margin of the tumor is compressed to form a sort of capsule for the tumor. The large spaces are lined by mucous membrane containing many goblet cells. Among the detritus in the lumen some ciliated epithelial cells are found. In smaller spaces the ciliated epithelium lining is distinct. About many of the spaces and cysts the muscle is arranged in circular or longitudinal layers as in the intestine. No lymph follicles are found. The cysts often are beset with connective-tissue papillæ, resembling the crypts in the intestine. Squamous epithelium lining cysts, or as solid nests, could not be found although its absence in the tumor cannot be affirmed since all the tissue was not examined. The stroma is composed as usual of connective tissue, smooth muscle and cartilage, but is not abundant because of the great number of cysts.

CASE X. Patient aged 29. Half a year after extirpation metastases developed in the region of the liver. Autopsy findings unknown.

Tumor measures 5 x 7 cm. The epididymis, plexus pampiniformis, and vas deferens normal. On the upper, posterior and lower surfaces normal testicular parenchyma is seen. The presence of testicular tissue on the posterior surface makes the development of the tumor from the rete testis out of the question. The tumor consists almost entirely of cysts, some of which are united by canals. The stroma is small in amount and contains a few islands of cartilage.

Microscopic.—The parenchyma of the testicle is normal although in some instances the canals are packed solid with epithelial cells. Cysts provided with a lining of high cylindrical epithelium are numerous, and from them glandular alveoli spring. These alveoli are lined by cubical epithelium with no mucous secreting cells. Some of the cysts contain ciliated epithelium. Beneath the lining epithelium a loose submucosa of connective tissue and a large amount of smooth muscle are present. The islands of cartilage are often surrounded by smooth muscle, and extend directly into the cysts in some cases, or by their growth push in the epithelium which may be the only structure between the cartilage and cyst cavity. This could explain the cases reported with cartilage in the testicular canals. The cysts with ciliated epithelium and surrounding smooth muscle, and the cartilage are interpreted as an anlage of the respiratory tract. The ectoderm is represented by cysts and spaces clothed with squamous epithelium. A few epithelial pearls are found. From the mesoderm the connective tissue, often of embryonic type, the smooth muscle, and the cartilage are developed. The blood vessels are also embryonic and not well developed. The great amount of smooth muscle is explained as a sort of work hypertrophy. The great number of cysts which are unable to discharge their contents enlarge and cause a corresponding stimulus to the growth of smooth muscle.

CASE XI. Tumor occurred in a young man, and had perforated the scrotum before extirpation. Measures 6 cm. in diameter. Spermatic cord and epididymis normal. The tumor is surrounded by the tunica albuginea, and at the upper pole remains of testicular tissue are apparent beneath the albuginea. The tumor has arisen within the testicle. It is compact in consistency, smooth in outline, and on section shows a few large spaces surrounded by a great number of cysts of various sizes and shapes. These are supported by a stroma of connective tissue in which are here and there islands of cartilage.

Microscopic.—The testicular tissue at the periphery of the tumor is normal; in places it is in direct connection with the tumor; in places separated by a capsule formed of compressed testicular tissue. Areas of necrosis are present, due to thrombosis of the vessels. The connective tissue is often myxomatous and is arranged about cysts and glands. The great number of round and spindle cells suggests a sarcoma. Cartilage with perichondrium is present, and at opposite poles of the tumor the islands are connected to form a kind of cartilaginous skeleton. A large amount of striated muscle is present, occurring in many places. Cells with radical or concentric striations in the protoplasm and often containing multiple nuclei are present. (Wilms does not discuss these further.) Smooth muscle is also abundant. Squamous epithelium is present as in the above cases as solid nests, or as lining for cysts. Papillæ of connective tissue are often found beneath. No attributes of the skin are found. Cylindrical epithelium lines cysts and canals. Goblet cells are sometimes present. Glands are located around the cysts and empty into them.

CASE XII. Patient 21 years old. Three years before observation pain in the left testis began and a small swelling was noticed. A slight trauma to the affected testis occurred two years later, and the growth increased rapidly in size. Extirpation of the testis followed and it was found to be the seat of a new growth.

The specimen measured 10 x 5 x 6 cm. and was completely surrounded by the tunica albuginea and tunica vaginalis. The spermatic cord, and its blood vessels, and the epididymis show no macroscopic changes. The surface of the tumor is smooth with the exception of two crescentic elevations located one at each pole. On section testicular parenchyma is found beneath the tunica albuginea in the region covered by epididymis. The main mass is cystic and in appearance resembles the normal testis, which is the seat of a carcinomatous or adenomatous new growth. No definite line of demarcation between the tumor and the remaining testicle tissue can be made out. Six nodules surrounded by capsules are found. Their structure is typical of teratoma, and they are in communication with the main tumor by means of fine canals penetrating the capsule. The interstitial tissue is in the form of bundles and contains much smooth muscle. Cartilage is also present and in one quadrant of the tumor is the predominant element.

Microscopic.—Spermatic cord, epididymis and vessels normal. The tissue of the testicle that remains shows distinct spermatogenetic and sustentacular cells, although spermatogenesis has ceased. The tissue adjacent to the tumor is somewhat

degenerated. From this testicular tissue the main mass of the tumor seems to have originated. It has an alveolar arrangement, a connective-tissue stroma supporting it. The alveoli are filled solid with cells and have the appearance of carcinomatous tissue. Within the main tumor are located the six nodular growths above described, which have the typical structure of teratomata. Connective tissue of embryonic type often growing concentrically about blood vessels after the manner of angio-sarcomatous tissue is present. Myxomatous tissue is very prevalent about islands of cartilage and appears to be developed from it. Bone is present, developing directly from the conective tissue, and also from the cartilage. Smooth muscle is very abundant, but striated muscle is present only in the teratomatous nodule. Cysts and spaces lined by a mucous membrane of columnar and goblet cells represent the entoderm. Squamous epithelial elements represent the ectoderm. Epithelial pearls are often present, and by their growth seem to have stimulated the connective tissue about them to the formation of giant cells. In some instances spaces are surrounded by giant cells, the epithelial pearl evidently having undergone complete degeneration. Cells resembling the interstitial cells of the testis are found throughout the tumor, and seem to have undergone proliferation.

Gessner reports three cases:

CASE XIII. Patient 48 years old. A tumor the size of a goose-egg is located in the right testis. Growth has been accompanied by pain during previous ten months. The tumor is surrounded by the tunica vaginalis and a fibrous capsule. The growth passes over into the epididymis, and the testicle and epididymis as such are no longer recognizable. On section many cysts are present; the largest are the size of a hazelnut, with muco-serous or pulpy contents. Islands of cartilage can be seen and also numerous areas of necrosis infiltrated with blood. The cysts are in some instances lined by cubical epithelium. Structures which represent an intestinal anlage are numerous. Cysts containing epidermoidal elements are also present and often contain epithelial pearls. The interstitial tissue is composed of fibrillated connective tissue, elastic tissue, cartilage and smooth muscle. Blind canals lined by cylindrical epithelium changing to low endothelioid cells suggests strongly lung tissue. Large cells surrounded by spindle-shaped nuclei bear a close resemblance to ova.

CASE XIV. Patient aged 32; has had for five months a growth in the right testicle, which now is the size of the fist. The tunica vaginalis and some remains of the testicle surround the tumor. On section the tumor consists of numerous cysts, some as large as a hazelnut. Communication between cysts is frequent. Definite islands of cells occur in places, either solid or with lumen. Cysts having a lining either of cylindrical cells with formation of crypts or goblet cells, or ciliated epithelium, are present. Cysts with epidermoidal elements are also present. Alveolar glands are noted in some portions. The interstitial tissue is composed of connective tissue, either white fibrous or mucoid. Abundant smooth muscle occurs. Elements of the peripheral and central nervous system, glia cells, ganglion cells and nerve fibres are found. Nodules are found in the nervous tissue surrounded by connective tissue, and contain osteoblasts with a deposit of calcareous salts. The veins of the spermatic cord are dilated and thrombosed. Some thrombi have a connective tissue membrane and contain cells resembling osteoblasts. Other thrombi contain nervous tissue elements, nerve fibres and cells, and ganglion cells.

CASE XV. Patient, aged 33 years. Tumor of testicle three-fourths size of the fist and egg-shaped. A capsule with smooth surface surrounds the tumor. The testicle and epididymis as such are no longer recognizable. On section a few small spaces and canals are noted but no large cysts. There is a bony area the size of a berry located in the substance of the growth.

Microscopic.—The main mass of the tumor is carcinomatous. There are canals lined by cylindrical epithelium, often with villi. A few canals with squamous epithelial lining are noted. The nodule of bone has a definite periosteum and a narrow cavity with osteoblasts. Cartilage with a perichondrium, smooth muscle and connective tissue of a cellular or myxomatous character forms the stroma. Cysts are present containing ganglion cells, the latter in some cases surrounded by epithelial-like cells.

Case reported by Coley and Buxton.[3]

CASE XVI. Patient 27 years old. A slight enlargement of the right testis was observed eight months before operation. No history of trauma. Physical examination revealed a tumor the size of an orange, symmetrical and firm. No enlargement of inguinal glands.

Pathological Examination.—Tumor about the size of an orange; testis forms a cap over upper pole. The whole is enclosed in the tunica vaginalis. The tumor also has a special fibrous capsule from which the testis can easily be removed. On section the tumor is made up of tough semi-translucent material containing minute cysts. Elements of all three germinal layers are present. The ectoderm is represented by epidermoidal cysts with no development of skin attributes. The mesoderm is represented by smooth muscle, mucoid and cellular connective tissue, and hyaline cartilage with beginning ossification. The entoderm is present as irregular villous cysts lined by columnar epithelium. In the wall of these are fibrous connective tissue and smooth muscle. Masses of swollen hyaline cells, packed in alveoli and in close connection with entodermal cysts may represent the chorda dorsalis. The entodermal elements greatly outnumber the ectodermal elements.

LaGrange[4] reports a case as follows:

CASE XVII. Patient's right testicle larger than left. No cause given. It is about the size of a hen's egg. Following extreme fatigue a large tumor in the abdomen was noticed situated near the umbilicus. At the same time the testicle grew rapidly to double the original size. Patient could not say whether the tumor of the abdomen preceded or followed the one in the testicle.

Autopsy.—The testicle is now the size of an orange, hard, heavy and in certain parts is of a cartilaginous consistency. In shape it is pyriform and with smooth surface. Both layers of the tunica vaginalis are bound together. The epididymis and the remains of the testicular parenchyma are no longer recognizable as such. On section the tumor is of a white color with reddish striations. Islands of cartilage can be seen. No cysts are visible to the naked eye. The tumor in the abdomen extends three fingers breadth above the umbilicus; measures 32 x 38 cm., and weighs 8 kilos. It is hard and resistant above, soft and cystic below. On section the cysts are found to be as large as hens' eggs. The stroma is arranged in whorls and cartilage can be felt as sharp points. In the mesenteric glands is found tissue similar to that found in the abdominal tumor.

[3] Coley and Buxton, Annals of Surgery, September, 1901.

[4] LaGrange, Bull. Soc. Anat. de Paris, 1881, lvi, 100–106.

Microscopic.—The tumor of the testicle contains cysts which are lined by cylindrical and squamous epithelium. The stroma consists of connective tissue and cartilage. The latter has become impregnated with calcium salts. Sarcomatous tissue is abundant and surrounds the cartilage in some places. The tumor of the testicle is reproduced in the mesenteric lymph glands and in the large tumor above described.

Case reported by T. V. Jackson.[5]

CASE XVIII. Patient aged 40 years. No family history of syphilis or tuberculosis. Tumor of the testicle removed at operation.

In gross appearance the tumor is massive, weighs 1 pound, is not resistant, and contains no fluid. No isolated masses of cartilage are seen. No involvement of glands in the inguinal region is present.

Microscopic.—Composite tumor congenital in origin. Stroma of connective tissue in which are bands of smooth muscle and islands of cartilage. Cysts are present lined by ciliated columnar epithelium, or by laminated epithelium which is undergoing keratoid change. Giant cells are present which resemble those of tuberculosis, although they may be of the nature of phagocytes (foreign body giant cells?).

The patient made a recovery, but later developed hæmoptysis, which was due to metastases to the lungs. Death resulted. No autopsy reported.

Case reported by Wm. F. Hendrickson.[6]

CASE XIX. Patient aged 25 years. The layers of the tunica vaginalis are bound together by adhesions. Two dome-like excrescences and a yellowish nodule represent tumor tissue, which is growing through the tunica vaginalis, and suggest that the adhesions may be due to tumor tissue. On section the dome-shaped excrescences are made up of a spongy network of blood vessels in a pinkish tissue.

Microscopic.—Cysts lined by stratified squamous epithelium are present and keratohyaline degeneration has occurred. A stroma of fibrous connective tissue contains hyaline cartilage and is infiltrated with polymorphonuclears and small round cells. Giant cells of foreign body type are present adjacent to cartilage. The dome-shaped tumors under the microscope are made up of a network of blood vessels, in the walls of which there has been a marked proliferation of epithelioid cells. The larger vessels have a perivascular growth which is papillomatous. Branches from the main vessel extend outward in a radiating manner, the connective tissue forming a papilla between each branch. The branching vessels are surrounded by perivascular new growth. An adrenal-like structure is also met with in the form of elongated masses of cells simulating those found in the cortex of the adrenal, and containing yellowish granules. The nuclei are deep staining and eccentrically placed. Lymphoid and plasma cells also present.

Case reported by Kockel.[7]

CASE XX. Child aged 3½ years. Congenital tumor of the right testicle. Consists of three parts : (a) solid portion; (b) small cystic portion; (c) large cystic portion. The whole tumor is encapsulated, and within the capsule the testicle is compressed. The epididymis and vas deferens are normal.

Microscopic.—The solid portion contains tissue of the central nervous system. Glia, nerve fibres, ganglion cells, and corpora amylacea which have undergone calcification. Hair, cartilage and bone are also present. Small cystic portion: Cysts surrounded by connective tissue lined by elements of epidermis, hair follicles surrounded by foreign body giant cells, and sebaceous glands occur. Cysts lined by cylindrical epithelium, glands of Lieberkühn, goblet cells and having a mucosa with muscularis mucosa are also present. Lymph nodules, islands of hyaline cartilage, connective tissue, fat, bone spicules and tissue resembling striated muscle are found. Large cystic portion. This is lined by epidermis. At one point the epithelium is cuboidal, with hair follicles and sebaceous glands. Smooth muscle occurs in the wall. The arrangement of the tissues suggests anlage of both the trachea and intestine.

Case reported by Lovett and Councilman.[8]

CASE XXI. Child three weeks old. Enlargement of scrotum noticed at birth, now the size of hen's egg. Considered a hydrocele on right side. Tumor grew rapidly and was removed at operation.

In gross appearance tumor was smooth in outline and occupied the region of the testicle. It measured 7 x 5 cm. The epididymis can be distinctly made out. On section tumor is seen to be made up of a stroma containing cartilage, within the meshes of which are many cysts. The largest of these measures 1 cm. in diameter.

Microscopic.—The cysts are lined by a variety of epithelial types, stratified squamous, simple low cuboidal, ciliated columnar, etc. Tissue containing pigmented epithelium resembles parts of the eye. Epithelial cells with oval nuclei and granular layer resemble the cones of the retina. The pigment granules are located between the cells. In the stroma is a large amount of striated muscle, cartilage, both hyaline and fibrous, and bone. The connective tissue resembles sarcomatous growth in places.

About seven months later a tumor grew in the right parietal region and seemed to have been pushed up through the skull. An exploratory operation was done but the growth was so extensive that it was deemed impossible to remove it. The cranium steadily increased in circumference at the rate of 1 cm. per day. Death soon followed.

At autopsy the tumor was found to have originated between the dura mater and the cranial bones. There were no adhesions between the dura and pia mater. The skin covering the tumor externally was not involved.

By microscopic examination, in addition to the usual derivatives of the three germinal layers, were found central nervous tissue. There was no differentiation into white and gray matter. Cells of Purkinje and nerve fibres were present. Striated muscle was also present, and aggregations of nuclei which are interpreted as muscle-plates.

Case reported by Robertson.[9]

CASE XXII. Patient aged 49. The tumor located in left testis was first noticed four months previous, and since has progressively increased in size. The growth was not accompanied by pain. The testicle was uniformly enlarged and on section the parenchyma is found to be largely replaced by fibrous connective tissue and cartilage. The whole tumor is enclosed within the thickened tunics of the testicle.

On microscopical examination numerous cysts are found

[5] Jackson, T. V., Lancet, London, 1900, ii, 86–126.

[6] Hendrickson, Wm. F., Univ. of Pennsylvania Medical Bulletin, August, 1901.

[7] Kockel, Festschrift für B. Schmidt, 1896, 153–171.

[8] Lovett and Councilman, Journal of Experimental Medicine, 1897, ii.

[9] Robertson, Proceedings of the Path. Soc. Phil., 1899, Dec., p. 36.

which are in some instances lined by columnar epithelium of simple or stratified variety; in other instances lined by squamous epithelium. These cysts are surrounded by layers of smooth muscle. The stroma is made up of myxomatous and fibrous connective tissue, hyaline cartilage, fat tissue and smooth muscle.

Case reported by Hayden.[10]

CASE XXIII. Patient 27 years of age. There is no family history of tuberculosis, malignant disease or syphilis. The patient, however, gives a history of two gonorrheal infections, and with the second one a right sided epididymitis. The right testis since has been slightly larger than the left. Two and a half months previous to admission the right testis began to increase in size and was accompanied by some pain. The right half of the scrotum on examination was found to be occupied by a smooth, painless, heavy and elastic tumor. The epididymis and testicle could not be differentiated. The scrotum was not adherent. No involvement of the glands could be made out. At operation the tunica vaginalis was normal in appearance. The cord was not thickened.

The pathologic report showed the tumor to be mostly made up of sarcomatous and carcinomatous elements. The sarcomatous elements consisted of small round cells, spindle cells and a few giant cells. The carcinomatous elements were arranged as in an adenocarcinoma. Some mucous cysts were noted. The stroma consists of smooth muscle, fibrous connective tissue and nodules of cartilage in which beginning ossification was noted.

Case reported by Schwarz.[11]

CASE XXIV. Patient aged 28. Seven months previous to admission to the clinic the patient noticed a swelling of the left testicle. The tumor increased in size gradually, causing no discomfort. The tumor was punctured, but only a little blood was obtained.

In the left side of the scrotum an oval tumor can be made out on palpation. At the lower pole a soft mass is felt which has the shape of the testicle. The spermatic cord and epididymis can also be differentiated. Several lymphatic glands the size of a bean can be palpated in the inguinal region. After removal the tumor is seen to be about the size of the fist, and is covered by the tunica vaginalis and tunica albuginea. Only the globus minor of the epididymis is unchanged. The remainder is much compressed. On section the tumor has a lobulated structure. In the septa between the nodules are cystic spaces. The lobules between the septa are composed of a soft myxomatous tissue, which is often of a yellowish-brown color (probably due to hemorrhage), and small islands of cartilage. Cysts are also present near the surface, lined by epidermis and containing desquamated epithelium and cholesterin crystals.

Microscopic examination shows that the cysts are lined partly by cylindrical epithelium in one or more layers, partly by cubical epithelium, and partly by epithelium so much flattened that it resembles endothelium. No attributes of the skin are present. Epithelial pearls are often found in the cysts lined by squamous epithelium. Polygonal epithelial cells deeply pigmented and arranged in two irregular masses resemble the pigment epithelium of the retina. The stroma consists of embryonic connective tissue (which has grown so rapidly that it resembles sarcomatous tissue), fibrous connective tissue, smooth muscle, hyaline cartilage, bone and lymph follicles. The blood supply is carried on by means of numerous blood vessels and spaces. They are so numerous in some places as to suggest an angioma. The arrangement of the smooth muscle, cartilage and cysts lined by cylindrical epithelium is such as to represent an anlage of the respiratory tract. Cysts with villus-like ingrowths of the cylindrical epithelial lining, surrounded by smooth muscle, represent an intestinal anlage.

Case reported by Schlagenhaufer.[12]

CASE XXV. Patient is 43 years old. The tumor is located in the left testicle and measures 11 x 8 cm. It is covered by a dense connective-tissue capsule 1 mm. in diameter. Septa extend inward from the capsule and divide the tumor into lobules. The parenchyma of the testicle and the epididymis are no longer recognizable. On section the tissue is brownish-red in color near the periphery, and grayish-red in the center. It is very friable. In the more fibrous portion cysts can be seen, either empty or containing a white glistening material. The structure bears a close resemblance to a deciduoma malignum of the uterus. A secondary growth is found in the lung about the size of a nut and sharply circumscribed from the surrounding tissue.

Microscopic examination shows elongated flattened spaces lined by one or more layers of cylindrical epithelial cells. The spaces lined by stratified squamous epithelium contain in the center an epithelial pearl. Spaces lined by a single layer of cylindrical epithelium are filled with the products of secretion. Tissue corresponding to embryonic lung, lymph follicles, smooth muscle and fibrous connective tissue is present. These elements, however, form a very small part of the tumor. The predominating tissue is composed of two varieties of cells closely associated with one another, and arranged to form irregular bands or circular structures and extend into spaces filled with blood. These masses have broken through into spaces lined by endothelium, or have grown along under the endothelial lining, thus elevating it. Within the lumen of a blood space at one point a tumor mass appears adherent to the endothelium; at another point a portion of the tumor appears free within the lumen. A study of the individual cells shows two types as above stated.

a. Masses of dark colored protoplasm, without cell division and multinucleated. The protoplasm is frequently vacuolated and contains leucocytes. No mitotic figures can be seen.

b. Polyhedral cells with light-colored protoplasm, heaped upon one another, without intercellular substance. The protoplasm is scant near the nucleus and contains glycogen. The nuclei are spherical with distinct chromatin network.

The former type is syncytium, the latter type Langerhans' cell layer. An examination of the metastatic growth in the lung shows only the syncytial cells and cells of Langerhans' cell layer arranged as in the primary tumor.

Case reported by Breuss.[13] Re-examined microscopically by Schlagenhaufer.

CASE XXVI. Patient is 40 years old. Six weeks previous to examination a painful swelling in the scrotum was noticed. At the same time pain in the right half of the body and dyspnœa developed.

By physical examination a hard tumor was found in the right testis. There was also dullness and râles over the lungs, a weak heart impulse, a loud double murmur at the apex, and tender-

[10] Hayden, American Med., May, 1902, p. 811.

[11] Schwarz, Inaugural Dissertation, Königsberg, 1900.

[12] Schlagenhaufer, Wiener klinische Wochenschrift, May, 1902.

[13] Breuss, Wiener medicinische Wochenschrift, 1878.

ness over the abdomen. Later vomiting, dyspnœa and icterus developed, the tumor meanwhile increasing in size. Exitus after four weeks.

At autopsy the right testicle was found to be the seat of a tumor larger than the fist and nodular. On section cystic spaces were found filled with a yellowish or brownish fluid, and separated from one another by compact septa. The veins about the cord were the seat of a secondary growth, which could be traced continuously through the vessels of the spermatic plexus, right internal spermatic vein, inferior vena cava to the right auricle. There were no adhesions to the walls of the vessels. The growth in the right auricle extends both through the tricuspid orifice into the right ventricle, and through the open foramen ovale into the left auricle and ventricle. The growth within the heart consisted of finger-like processes with transparent yellowish lobules with cloudy opaque centers. The metastatic growth in the lung resembled in all respects that found in the heart.

Microscopic Examination.—The tumor in the testicle is composed of bands of myxomatous and fibrous connective tissue, and between these, nests of sarcomatous and carcinomatous tissue and cysts lined by cylindrical and cuboidal epithelium and goblet cells. The secondary growth within the veins and heart are composed of a myxomatous tissue covered by a layer of epithelial cells. At times divisions between these cells can be made out, but long masses of multinucleated protoplasm are also present. "The form, staining reactions, of the multinuclear syncytial masses and polygonal epithelial cells correspond closely to the epithelium of the chorionic villi." This case is interpreted by Schlagenhaufer as a hydatidiform mole.

The following summary regarding this class of tumors is based on a study of our own cases and those reported in the literature.

Structure.—The gross appearance depends upon the proportionate development of the elements which make up the tumor. The tumors are generally cystic, and when distended with secretion the consistency is firm. At other times the consistency is soft and fluctuating. Resistant areas are often made out on palpation, due generally to the presence of cartilage or bone. The surface of the tumor may be smooth, or where nodules of solid tumor or cartilage are present, irregular. The epididymis and vas deferens are in most cases not involved, although the size of the tumor may mask their presence. On section the cystic structure can generally be made out with the naked eye, and a definite cyst lining is in some cases distinct. Papillary ingrowths are often present. The cyst contents vary. They may be mucilaginous, colloid-like, serous, or sebaceous. Hair has been found in some cyst cavities. Supporting the cystic structure is a stroma for the most part appearing as connective tissue, in which islands of cartilage can often be seen as minute, pearl-colored, translucent areas.

Microscopic Appearance.—Elements of the three primary germinal layers are constantly present except in Case IX, where no derivative of the ectoderm was found, but Wilms could not say positively that it was absent, since the whole tumor was not sectioned. Derived from the entoderm we find cysts or spaces with a lining of plain or ciliated columnar epithelium. Sometimes this is in a single layer, sometimes it is stratified. Goblet cells and gland alveoli may occur. The inner surface of the cyst may be smooth or may be thrown into papillæ with intervening crypts. Derived from the ectoderm we find epidermal elements in the form of a lining for cysts, or as solid processes. Degeneration often takes place in the solid processes, giving rise to cyst formation. The cells are often arranged as in the skin with all the different layers represented. An epithelial pearl frequently occupies the cavity of a cyst. Hair and sebaceous glands are rarely present, but were reported in connection with Case XX. Elements of the cerebral and peripheral nervous system were present in Cases XIV and XX. They are rarely present. The mesoderm is abundantly represented in most cases. Connective tissue, myxomatous and compact, smooth muscle and cartilage are the most constant elements. Bone was present in Cases III, XIV, XV, XVI, XX, XXI, XXIII and XXIV. Striated muscle occurred in Cases III, XI and XXI. The development of the circulatory system in the tumors varies. In some cases areas are found composed of nothing but blood vessels, as in Cases XIX (Hendrickson) and XXIV (Schwarz); then again only a few blood channels are found, as in Case I. In none of the above cases except Hendrickson's and Schwarz's were well developed blood vessels mentioned. The circulation seems to be carried on in many cases by channels lined by endothelium running within the stroma. Frequently the connective tissue is very cellular, and histologically has all the appearance of sarcomatous tissue. Giant cells of foreign body type are often present. They are arranged around epithelial pearls (Case XII), cartilage (Case XIX), and hair follicles (Case XX). Cells closely resembling ova surrounded by spindle-shaped nuclei are described in Case XIII. The arrangement of these different tissues is often such as to suggest the anlage of some organ. The rudimentary trachea and intestine are most frequently represented. In Case XIII Gessner found spaces lined by cuboidal epithelium with blind offshoots where the epithelium became flat. He was of the opinion that it represented the anlage of the lung. A similar anlage is noted by Schlagenhaufer in Case XXV. In Cases XXI (Lovett and Councilman) and XXIV (Schwarz) tissues representing the anlage of the eye were described.

The three germinal layers do not develop equally, but the entoderm and mesoderm are always in excess of those of the ectoderm.

The large majority of these tumors develop in adults. Wilms was able to collect only four cases of undoubted congenital teratoma, to which should be added the cases reported by Lovett and Councilman, and Kockel. In the above twenty-six cases the age is given in only seventeen. In all but two (the congenital cases) it ranged between twenty-one to fifty years. There were eight cases in the third decade, two in the fourth, and seven in the fifth.

Etiology.—No explanation has shown satisfactorily why these tumors develop in adults. Traumatism has been reported in a few cases, but the clinical history has been so

rarely given that reliable data on this point are not obtainable. In only five instances in the above twenty-one cases was the presence or absence of traumatism stated. In Case III trauma occurred fifteen years previous to the development of the tumor. In Case XII trauma occurred two years after the growth had been noted. In Cases I and XVI absence of traumatism is definitely stated. In none of the above cases therefore could the growth of the tumor be directly or indirectly attributed to traumatism.

Origin.—Among the theories which have been advanced to explain the origin of these tumors are the following:

1. *The Theory of Metaplasia.*—It is assumed that one variety of tissue can change into another. Cysts were supposed to originate from the epithelium of the tubules in the testis, or from solid processes of cells derived from the tubules, the central portion degenerating, thus forming a cyst. This activity on the part of the epithelium was supposed to exert a stimulus on the connective tissue, which gave rise to the formation of cartilage, bone, etc. In cases where cartilage was found to antedate the cysts its development was supposed to stimulate the growth of epithelium. Ciliated epithelium was traced back to the remains of the Wolffian body. This theory does not admit of the possibility that all the elements of the tumor have a common origin. It is not accepted at the present day.

2. *Fœtus in Fœtu.*—Advanced by Meckel. This theory assumes that two ova are impregnated, both develop, one finally overpowering and enclosing the other.

Klebs divides the teratomata into—

(1) Endogenous—which result from the infolding of tissues during development.

(2) Ectogenous—which develop from a fœtal implantation.

He further subdivides the ectogenous form into—

(a) Allantoid variety, in which the rudimentary fœtus develops in one of the body cavities of the other.

(b) Pre-allantoid, in which there is a complete or partial fusion of the two germinal areas, one becoming enclosed in the other.

Klebs states that in the allantoid variety a placenta and umbilical cord are found, while in the pre-allantoid variety they are absent. Wilms says of this theory that no organ of the principal fœtus could contain such a rudimentary parasitic fœtus, although it might well account for teratoid tumors in the body cavities. We could not explain Case II by this theory, since it would of course belong to the pre-allantoid variety yet has placental tissue in it.

3. *Theory of Cell Inclusion.*—This is a more recent theory advanced by Bonnet,[14] and assumes that either a fertilized polar body or that after the impregnation of the ovum, and during the early segmentation period, a cell or group of cells becomes separated and incorporated among the structures, which later develop into the testis. That such a separated segmentation cell even up to the sixteen-cell stage has the power of developing into a fœtus has been proven experimentally in animals by Roux, Wilson, Hertwig and others. Barker notes that "Roux has noticed isolated segmentation cells in the body of young frog larvæ, and suggested that they might be of significance in the etiology of tumors." We do not know, however, the exact method by which such a cell could be included within the testis.

4. *Development from Cells Normally Present in the Testis.*—Wilms has shown conclusively that these teratomata arise in the rete testis, and has endeavored to trace their origin back to the true cells of the organ. He believes the tumor grows within the tubules and in proof of this points out that in one of his cases he found teratoid tissue in the adenomatous tissue of the tumor, and has also found it in a normal tubule. Growth within the tubules explains, as he believes, the corkscrew-like growth of the gland alveoli and the cyst formation. Malassez, on the other hand, believes the growth begins in the interstitial tissue, and cites instances where normal testicular tubules were found within the tumor. Wilms explains this fact by development within the tubules, the tumor by pressure shutting off some tubules and preventing growth into them. If the tumor develops within the tubules we have only the spermatic cell as a point of origin, since the sustentacular cell is not a germinal element. If it arises in the interstitial tissue Wilms suggests that it might originate in some way from the so-called interstitial cells of Leydig since Nussbaum believes these to be undeveloped germ cells. This view as to their significance, however is not unquestioned. How either the spermatogenic or the interstitial cell can develop into a teratoma is not known, and Wilms gives no explanation further than to say that the germ cell may have been pathological from the beginning or normal at first, later becoming pathological.

5. *Partial Hermaphrodism.*—Assumes the presence of an ovum in the testis, which after fertilization develops into a fœtus. This theory does not explain the tumors present at birth, or developing shortly after.

In discussing the relative merits of these theories we must consider the conditions which are to be explained. We have to explain the origin of a tumor which constantly contains derivatives of all three germinal layers, grows in the rete testis and in the majority of the cases develops in adult life. The theories of metaplasia, of fœtus in fœtu (since Kockel notes a case of teratoma in both testicles of the same individual), and of partial hermaphrodism do not explain these conditions, therefore may be discarded. We do not know how a spermatogenic cell could by itself give rise to a teratoma, and we do not know that Nussbaum's theory as to the significance of the interstitial cells is correct. The cell inclusion theory seems to be the most plausible, but leaves much to be explained. We cannot apply the results of experimental teratology on the lower animals to the human being. We cannot explain definitely how a segmentation cell can be included in the testis.

The occurrence of syncytial and decidual-like cells is noted in Cases II, XXV and XXVI.

[14] Bonnet, Monatschrift für Gynäkologie, Bd. xiii.

In Case II we cannot say positively whether we are dealing with true decidual cells or some other type of cell which resemble them. The cell type in question is, however, so closely associated with the syncytial cells that we are forced to conclude that they are either decidual cells or cells derived from Langerhans' cell layer, probably the latter.

Regarding the histogenesis of these cells there is still considerable difference of opinion, and it does not come within the scope of this paper to discuss the subject in detail. Briefly, however, it may be said that while Minot, Gottschalk, Kastschemke and others believe that both the syncytium and Langerhans cell layer are derived from the fœtal ectoderm, Langerhans, Kossman and Merrtens believe the syncytium to be derived from the epithelium of the endometrium, and the cells of Langerhans layer from the fœtal ectoderm. If the latter view is correct then we must assume the presence of an anlage of the uterus in these tumors. No tissue, however, was found which was interpreted as such. If both the syncytium and Langerhans' cell layer are fœtal ectoderm then they should be classed with the proper elements of the tumor. Schlagenhaufer believes both varieties of cells are fœtal in origin. He expresses his belief that the cells of fertilized ovum or polar body destined under normal conditions to form placental tissue give rise to the syncytial cells and cells of Langerhans layer. Furthermore, he believes that the Langerhans' cell layer can develop into syncytium and frequently observed such a transition in his specimens. The presence or absence of placental epithelium in teratomata depends, according to Schlagenhaufer's view, upon whether a fertilized cell in a comparatively early or late stage of development suffered inclusion. If placental epithelium is present he assumes that the tumor originated from a fertilized polar body; if absent, it originated from a blastomere.

Malignancy.—In Case V of Wilms series, tumor masses were found in the veins of the pampiniform plexus, which on section were cystic. Microscopically all three germinal layers were represented.

Case XIV, Gessner. The veins of the spermatic cord were thrombosed by tissue, which contain nerve cells, nerve fibres, ganglion cells and osteoblasts. All these were present in the primary tumor.

In Case XVII, reported by La Grange, a teratoma of the right testis was followed after extreme fatigue by a tumor of the abdomen, which microscopically corresponded to the growth in the testis.

In Case XXI, reported by Lovett and Councilman, we find a teratoma of the testis, which after removal was followed by a similar tumor of the cranial cavity. No connection between the two is claimed, since to metastasize, a portion of the tumor would have to be transplanted from the testis to the cranium. This is extremely improbable, especially as there were no metastases in the lungs or other internal organs.

In Case XXV (Schlagenhaufer) a secondary growth was found in the lungs, which microscopically was found to be composed of syncytial cells and cells of Langerhans' layer arranged in the same manner as those found in the primary tumor.

In Case XXVI (Schlagenhaufer) a continuous growth could be traced within the vessels of the spermatic plexus to the heart. Macroscopically the growth was fungoid in character; composed of finger-like processes. Microscopically the structure of the secondary growth was composed of myxomatous tissue covered by syncytial cells and cells of Langerhans' layer.

The presence of the placental epithelial elements in the metastases but not in the primary tumor is explained by the fact that within the vessels these elements have a better physiologic environment for development (Schlagenhaufer).

From these instances we must conclude that teratomata are sometimes malignant. The metastases, however, differ from those of carcinoma and sarcoma in that they cannot be due to the transplantation of individual tumor cells (except where only one type of tissue is represented in the secondary growth), but rather to a continuous growth of the teratoma, or to a transplantation of a small portion of it.

Can the individual elements of a teratoma, the stroma and the epithelium undergo a malignant change? In nearly every one of the cases reported above some portion of the tumor when examined microscopically suggested malignancy, and in many cases the original diagnosis was that of malignant tumor. But we cannot depend upon the microscopic picture alone to decide this point, inasmuch as the appearance of embryonic and malignant tumor tissue is so nearly alike. Clinical evidence must also be taken into consideration. The development of malignancy in the placental tissue of teratomata is believed by Schlagenhaufer to be dependent upon the proliferating power of the cells. This in turn is dependent upon the inclusion of a fertilized cell in the earliest stages of development. "The earlier the inclusion in the development of the ovum, the higher the inborn power of the tumor cells to become clinically malignant." In Case V (Wilms) we have sarcomatous tissue penetrating the tunica albuginea and infiltrating the epididymis. It could not be determined, however, whether the sarcoma originated from the interstitial tissue of the testis or from the mesodermic elements of the teratoma.

Case XIX, reported by Hendrickson, of a teratoma testis showing perithelial angio-sarcomatous growth may be such a case. Adhesions between the tunica vaginalis were assumed to be metastases, but their microscopical structure was not given. There seems to be no way of determining whether this growth originated from the tissue of the teratoma. No clinical history is given. In Cases XXV and XXVI, however, this question is clearly answered in the affirmative. Since the placental epithelial elements in the metastases must have been derived from the embryonic elements of the tumor.

The presence of a malignant tumor of a testicle in which there was also a teratoma is illustrated by Case X of Wilms series. The greater part of the testicular parenchyma that

remains is normal, but that nearer the tumor shows the alveoli packed with cells. From this tissue the main mass of the tumor is derived and is of a carcinomatous nature.

In conclusion regarding malignancy we can say:

1. Teratoma can be malignant by growth along blood or lymph channels. The secondary growth being composed of derivatives of one or more of the three germinal layers.

2. Malignant new growth, originating from the tubules of the testis, and teratoma testis may exist simultaneously.

We are indebted to Dr. G. C. Madill, of Ogdensburg, New York, for the clinical history of Case I.

NOTE.—After this paper had gone to the press, we learned from Dr. Madill that his patient, Case I, shortly after the attack of typhoid fever, had developed an abdominal tumor in the epigastric region.

The tumor increased rapidly in size and the patient became progressively weaker and died on September 5, 1902. A partial autopsy was performed and a tumor mass was found surrounding the head of the pancreas but not involving it.

Portions of the tumor tissue were removed and sent to us for diagnosis. Microscopic examination of the tissue showed that it was made up of cells irregular in shape and size, often containing budding nuclei.

The arrangement of the cells in places resembled that found in carcinoma but the greater part of the tumor was definitely sarcomatous.

CORRESPONDENCE.

BERLIN, GERMANY.

To the Editor:—In THE BULLETIN February-March, 1902, Young described a modification of my prostatic incisor under the title of "A New Combined Electro-Cautery Incisor for the Bottini Operation for Prostatic Obstruction." According to him the chief advantage of this modification is, that knives of different heights may be used. Young believes to have brought out something new by this, but he is mistaken.

As proof of the above statement, I quote the following from my article of January-February, 1900, entitled: "Neue Mittheilungen zur Galvanokaustichen Radikalbehandlung der Prostatahypertrophie per vias naturales (Bottini'sche Operation)."[1]

"*Theoretically* the *depth* of the incision is represented by the height of the galvanocaustic knife, measured from its tip to the shaft at a right angle. It would seem, therefore, taking as an example the middle lobe, which may vary in size, to be an advantage, to have knives of different heights at our disposal. For this reason I had galvanocaustic knives made for me, measuring from 0.8, 1.0, 1.2 and 1.4 to 1.5 cm. I choose one of these, according to the cystoscopic finding, and, what is still more important, the *rectal finding taken after the instrument has been introduced and turned backward.*"

I added the following note at the time (Footnote No. 17):

"As a rule, my instruments are manufactured with a knife of 1.2 cm., *which represents the height mostly used*, 0.8 cm. seems to me to be dispensable; 1.4 to 1.5 cm. is too high for many cases and has this further disadvantage, that the tendency to bend is naturally greater because of the increased height. It need only to be mentioned that the incision can be deepened by recutting in the incision either during the same sitting or at a later one."

[1] Deutsche Medizinal-Zeitung, No. 1–6, 1900.

I treated on the same question in my article on "The Treatment of Hypertrophy of the Prostate Gland by the Galvanocaustic Method after Bottini," in W. H. King's "Electricity in Medicine and Surgery." It may be found on p. 206, and is as follows:

"The depth of the incision is dependent, on the one hand, on the fact that the instrument be firmly pressed upon the prostate gland; on the other hand, on the height of the knife. I possess knives of various sizes, from 0.8 to 1.5 cm. in height, and choose between them dependent on the thickness of the prostate gland. As an average size 1.2 cm. is to be designated; my instruments are supplied with this size unless another size is especially ordered. The incision may also be deepened if the instrument is firmly pressed down and the knife is moved to and fro for a second time, along the furrow. In general, however, this is not expedient."

To be sure, I did not have an entirely new instrument made for each different knife; with my instrument, different male parts alone are necessary, the female remaining the same. The only difference between this and Young's is, that in his, a part of the outer end of the male portion remains the same. It is a question if there is any advantage in his arrangement, because the expensive part of the instrument is the platinum-iridium knife, of which one must have several in either case. The disadvantage of Young's is that the male part is made up of two pieces whereby it suffers in simplicity and safety.

In addition, I wish to emphasize that, as my experience increases, I have become convinced that knives of different heights are not of the great significance which I formerly thought, but one averaging 1.2 to 1.3 cm. in height is sufficient for all cases.

I may be allowed, as substantiation of this, to state that in my last 37 cases, as far as I can remember, all—or, at least, nearly all—were operated with a knife of 1.2 cm. height and in these 37 cases (excepting one death, one non-success in a

case with a small prostate, and one case which was operated too recently to allow of any opinion on the result) there were 34 successful results, 27 cases being cured and 7 decidedly improved.

At all events, from the above given quotations it is shown that the instrument recommended by Young can not be designated as "A New Electro-Cautery Incisor," but at most as a modification of mine. I must add that Young himself, in a letter to me, correctly recognizes this. He writes (March 24, 1902): "The instrument in question is merely a modification of your own splendid instrument."

ALBERT FREUDENBERG, M. D.

Berlin, S. W. Wilhelmstr. 20.

REPLY OF DR. YOUNG.

When I published the article entitled "A New Combined Electro-Cautery Incisor," I used the word "new" to designate a combination, which was and is an essentially novel plan. Although I had read numerous articles by Dr. Freudenberg I had failed to see the one in which he had spoken of employing more than one blade in his operations, else I should have referred to it. I had sent for his instrument and it was furnished with one blade, and in none of the subsequent catalogues of the German instrument-makers have I seen any reference to there being but one instrument and that with a single blade of given height.

I have now operated on over 70 cases of prostatic hypertrophy, and in this series have encountered the greatest variation in such hypertrophy as to size, shape, and consistence. In some the enlargement was as great as an orange; in others there was no enlargement at all, a mere sclerosis or fibromatous metaplasia, with little or no increase in size. Several cases of the latter type, where I feared to use Freudenberg's instrument lest the blade might cut too deeply, brought forcibly to my mind the need of blades of different sizes, small for very small prostates, medium for the usual enlargement, and large for great hypertrophies.

I wrote in March, 1901, to a prominent importing house in New York to ask if Freudenberg's instrument could be furnished with blades of different sizes, and received a negative reply. I then decided to have several blades constructed, similar in every way to the male blade of his instrument, each with the large screw traction wheel and axle firmly attached to it (as it now appears Dr. Freudenberg had done).

Realizing that such a combination would form a most cumbersome and unwieldy "set," I decided to substitute a simple mechanism whereby each blade might be easily detached from the traction apparatus, so that the latter would do for all blades. In the meantime, other defects in Freudenberg's instrument had been detected which have in part been described in the paper in THE BULLETIN (q. v.) and changes were made to obviate them. In the end the following additions and alterations were made:

1. Four blades were constructed, .8, 1.2, 1.7, and 2.1 cm. high, which could be interchanged by the mere elevation of a "spring catch."

2. The mechanism of the connecting handle was radically changed so as to do away with the defective contact and overheating of Freudenberg's instrument.

3. The shaft was made so as to allow longer incisions for the great hypertrophies.

4. The beak was changed from the gentle slope, which frequently slipped into the urethra during the operation with unpleasant results, to a more rectangular shape, which effectually prevents such catastrophies.

5. The male blade was enlarged and changed so as to better carry a larger current, and the mechanism of attaching the platinum blades to the shaft was improved and strengthened.

6. The tedious screw which held the traction apparatus to the female blade was replaced by a quick-working "bayonet lock," thus greatly facilitating the change of blades and the cleansing of the instrument.

Other minor alterations were also made, but those I narrated seemed to justify the title "new," which was intended to apply to the combination and not to the single instrument itself, which I frankly stated was based on Freudenberg's model, the excellence of which I again acknowledge, as I did in the letter quoted by Dr. Freudenberg. A new instrument is not necessarily an entirely original one.

Dr. Freudenberg says that he now believes "that one blade is sufficient for all cases," that he has given up his "combination." We are not surprised that he has found it more agreeable to use his old instrument. With the "new" combined incisor, I find the ability to choose a blade to suit the size of the hypertrophy of the greatest value, and as the instrument has been used in now about 30 cases with perfect satisfaction, I can assure Dr. Freudenberg that his assertion that the improvement on his valuable incisor "suffers in safety" is incorrect, and, in fact, unwarranted (as he has never seen the instrument).

During the last year I have operated and cured with the small blade, several cases in which Freudenberg's instrument would probably have penetrated the prostatic capsule, and resulted fatally; and on the other hand, I have had success with the large blade in cases of great hypertrophy in which the 1.2 cm. blade, which Dr. Freudenberg now uses could not, I believe, have sufficiently cauterized for radical cure.

HUGH H. YOUNG.

Baltimore, July 13, 1902.

NOTES ON NEW BOOKS.

The American Year-book of Medicine and Surgery for 1902. A yearly Digest of Scientific Progress and Authoritative Opinion in all branches of Medicine and Surgery, drawn from journals, monographs, and text-books of the leading American and foreign authors and investigators. Arranged, with critical editorial comments, by eminent American specialists, under the editorial charge of George M. Gould, A. M., M. D. In two volumes: Volume II, *General Surgery*. Octavo. 684 pages. Illustrated. (*Philadelphia and London: W. B. Saunders & Co., 1902.*) Per volume: cloth, $3.00 net; half morocco, $3.75 net.

The general scope of the Year-book is too well known to need any explanation. In this year's volume on surgery the first 363 pages, out of a total of 656 pages of reading matter, are devoted to general surgery; gynecology and obstetrics cover 170 pages, thus giving 533 pages for these major subjects. The remaining limited space is devoted to the specialties. Of the subjects which are discussed at considerable length we notice anesthetics, fractures, diseases of the respiratory and vascular systems, hernia, appendicitis, diseases of the liver. In the 363 pages of somewhat coarse print devoted to general surgery it is, of course, impossible to give anything like as adequate a review of the subject as is to be found in the standard German and French works of this character, such as *L'Annee Chirurgicale* and Hildebrand's *Jahresbericht*, but very many valuable papers are abstracted at some length. As a digest of scientific progress and authoritative opinion drawn from American and foreign sources, the section devoted to surgery fails to meet our expectations. If the book claimed to be a discussion of the views of leading American writers it would be nearer the truth. The vast majority of the reviews are those of papers in the English language, which of course means that a large number of extremely important foreign papers fail to receive any notice whatever. As an example of this we may take the chapter on Surgical Diseases of the Liver. Thirty-two papers are abstracted and discussed. Of this number all but three are from papers printed in the English language, and twenty-three or over two-thirds are abstracts of papers by American writers. If the Year-book is to be made what it claims to be, a general review of the opinions of both American and foreign writers, this fault should certainly be corrected in future volumes, for not only is this true of diseases of the liver which we have taken as an example, but the preponderance of abstracts from American and English sources is equally striking in all subjects. The chapters devoted to gynecology and obstetrics show evidence of much wider reading and more careful selection of articles from the literature on the part of the editors of these chapters. This section of the book should prove of great value to both specialists and the general practitioner who desires a fairly complete review of latest opinions on these subjects. The chapters devoted to the specialties cover so little space that we fail to see how they can be of very great help to specialists, although they may be of some aid to general practitioners in calling attention to important topics. As an example of the very brief space allowed to the specialties, we notice that only ten pages are devoted to the entire subject of orthopedic surgery, in which branch there are so many active workers at present. Such reviews, grouping together the most important papers on various subjects in one volume, may be made of the greatest value, and we hope that the American Year-book may be improved in the future so as to compare favorably with similar publications in Germany and France.

BOOKS RECEIVED.

The Diagnosis of Surgical Diseases. By Dr. E. Albert. Authorized translation from the eighth enlarged and revised edition by Robert T. Frank, A. M., M. D. With fifty-three illustrations. 1902. 8vo. 419 pages. D. Appleton & Company, New York.

Atlas and Epitome of Operative Surgery. By Dr. Otto Zuckerkandl. Second edition, revised and enlarged. Authorized translation from the German. Edited by J. Chalmers Da Costa, M. D. With 40 colored plates and 278 illustrations in the text. (Saunders' Medical Hand-Atlases.) 1902. 12mo. 410 pages. W. B. Saunders & Company, Philadelphia and London.

Atlas and Epitome of Otology. By Gustav Brühl, M. D., with the collaboration of Prof. Dr. A. Politzer. Authorized translation from the German. Edited by S. MacCuen Smith, M. D. With 244 colored figures on 39 lithographic plates, and 99 text illustrations. (Saunders' Medical Hand-Atlases.) 1902. 12mo. 292 pages. W. B. Saunders & Company, Philadelphia and London.

A Practical Manual of Insanity.—For the Medical Student and General Practitioner. By Daniel R. Brower, A. M., M. D., LL. D., and Henry M. Bannister, A. M., M. D. 1902. 8vo. 426 pages. W. B. Saunders & Company, Philadelphia and London.

A System of Physiologic Therapeutics. Edited by Solomon Solis Cohen, A. M., M. D. Volume VI.

Dietotherapy and Food in Health. By Nathan S. Davis, Jr., A. M., M. D. 1901. 8vo. 372 pages. P. Blakiston's Son & Co., Philadelphia.

Diseases of the Intestines. Their Special Pathology, Diagnosis, and Treatment. By John C. Hemmeter, M. D., Philos. D. Volume II. Appendicitis, Tuberculosis, Syphilis, Actinomycosis of Intestine, etc. With plates and many other original illustrations. 1902. 8vo. 679 pages. P. Blakiston's Son & Co., Philadelphia.

Saunders' Pocket Medical Formulary. With an Appendix containing Posological Table; Formulæ and Doses for Hypodermic Medication; Poisons and their Antidotes, etc. By William M. Powell, M. D. Sixth edition, thoroughly revised. 1900. 16mo. 297 pages. W. B. Saunders & Company, Philadelphia.

University of Pennsylvania. Contributions from the William Pepper Laboratory of Clinical Medicine. No. 2. (Reprints.) 1901. Philadelphia.

Syphilis. A Symposium. Special Contributions by L. Duncan Bulkley, A. M., M. D.; Follen Cabot, Jr., M. D.; Louis A. Duhring, M. D. 1902. 12mo. 120 pages. E. B. Treat & Company.

Diseases of Women. A Manual of Gynecology. Designed Especially for the Use of Students and General Practitioners. By F. H. Davenport, A. B., M. D. Fourth edition, revised and enlarged. With 154 illustrations. 1902. 12mo. 405 pages. Lea Brothers & Company, Philadelphia and New York.

Manual of Child-bed Nursing. With Notes on Infant Feeding. By Charles Jewett. Fifth edition, revised and enlarged. 1902. 12mo. 84 pages. E. B. Treat & Company, New York.

The International Medical Annual. A Year-book of Treatment and Practitioner's Index. Twentieth year. 1902. 12mo. 688 pages. E. B. Treat & Company, New York.

A Laboratory Guide in Elementary Bacteriology. By William Dodge Frost, M. S. Second revised edition. Illustrated. 1902. 8vo. 355 pages. Published by the Author, Madison, Wisconsin.

Transactions of the College of Physicians of Philadelphia. Third series. Volume the Twenty-third. 1901. 8vo. lxxii + 320 + 143 pages. Printed for the College, Philadelphia.

An Introduction to Physiology. By William Townsend Porter, M. D. Part IV, Physiological Optics. 1902. 12mo. 99 pages. The University Press, Cambridge, Mass.

Ophthalmic Myology. A Systematic Treatise on the Ocular Muscles. By G. C. Savage, M. D. Sixty-one illustrative cuts and six plates. 1902. 12mo. 589 pages. Published by the Author, 139 N. Spruce Street, Nashville, Tenn.

Philadelphia Hospital Reports. Volume IV. 1900. Edited by Roland G. Curtin, M. D., and Daniel E. Hughes, M. D. 1901. 8vo. 324 pages. Philadelphia.

The Operations of Surgery. Intended Especially for the Use of those Recently Appointed on a Hospital Staff and for those Preparing for the Higher Examinations. By W. H. A. Jacobson, M. Ch. Oxon., F. R. C. S., and F. J. Steward, M. S. London, F. R. C. S. Fourth edition. With five hundred and fifty illustrations. Two volumes. 1902. 8vo. P. Blakiston's Son & Company, Philadelphia.

The Principles of Bacteriology. A Practical Manual for Students and Physicians. By A. C. Abbott, M. D. Sixth edition, enlarged and thoroughly revised. With 111 illustrations, of which 26 are colored. 1902. 12mo. 641 pages. Lea Brothers & Co., Philadelphia and New York.

The Climates and Baths of Great Britain. Being the Report of a Committee of the Royal Medical and Chirurgical Society of London. C. Theodore Williams, M. D., Chairman; P. Horton-Smith, M. D., Hon. Secretary. Volume II—The Climates of London and of the Central and Northern Portions of England, Together with those of Wales and of Ireland. 1902. 8vo. 628 pages. Macmillan & Company, Limited, London; The Macmillan Company, New York.

Diseases of the Nose, Pharynx, and Ear. By Henry Gradle, M. D. Illustrated. 1902. 8vo. 547 pages. W. B. Saunders & Company, Philadelphia and London.

Quain's Dictionary of Medicine. By Various Writers. Third edition, largely rewritten and revised throughout. With fourteen colored plates and numerous other illustrations. Edited by H. Montague Murray, M. D., F. R. C. P., assisted by John Harold, M. B., B. Ch., B. A. O., and W. Cecil Bosanquet, M. A., M. D., M. R. C. P. 1902. 8vo. 1892 pages. D. Appleton & Company, New York.

Nothnagel's Encyclopedia of Practical Medicine. Diphtheria. By William P. Northrup, M. D. *Measles, Scarlatina, German Measles.* By Theodor von Jürgensen, M. D. Edited, with additions, by William P. Northrup, M. D. Authorized translation from the German, under the editorial supervision of Alfred Stengel, M. D. 1902. 8vo. 672 pages. W. B. Saunders & Company, Philadelphia and London.

The Clinical Pathology of the Blood. By Dr. Rud. R. v. Limbeck. Translated from the second German edition by Arthur Latham, M. A. (Oxon. et Cantab.) M. R. C. P. Lond., and John Nachbar, M. A., M. D. Cantab. 1901. 8vo. 333 pages. The New Sydenham Society, London.

Anatomy in its Relation to Art. An Exposition of the Bones and Muscles of the Human Body, with Especial Reference to their Influence upon its Actions and External Form. By George McClellan, M. D. Illustrated by three hundred and thirty-eight original drawings and photographs made by the author and expressly prepared for this work. 1901. 4to. W. B. Saunders & Company, Philadelphia and London.

Medical Lectures and Aphorisms. By Samuel Gee, M. D. 1902. 16mo. 296 pages. Smith, Elder & Company, London.

A System of Physiologic Therapeutics. Edited by Solomon Solis Cohen, A. M., M. D. Volume IX, Hydrotherapy, Thermotherapy, Heliotherapy, and Phototherapy. By Dr. Wilhelm Winternitz, assisted by Dr. Alois Strasser and Dr. B. Baxbaum, and Balneology and Crounotherapy, by Dr. E. Heinrich Kisch. Illustrated. 1902. 8vo. 570 pages. P. Blakiston's Son & Co., Philadelphia.

Atlas and Epitome of Traumatic Fractures and Dislocations. By Prof. Dr. H. Helferich. Authorized translation from the German. Edited by Joseph C. Bloodgood, M. D. Fifth edition, revised and enlarged. With 216 colored illustrations on 64 lithographic plates and 190 figures in the text. (Saunders' Medical Hand-Atlases.) 1902. 12mo. 353 pages. W. B. Saunders & Company, Philadelphia and London.

Transactions of the Medical Association of Georgia. Fifty-third Annual Session. 1902. 8vo. 486 pages. Published by the Association, Atlanta, Ga.

The Medical Annual. A Year-book of Treatment and Practitioner's Index. Twentieth year. 1902. 12mo. John Wright & Co., Bristol; Simpkin, Marshall, Hamilton Kent & Co., Ld., London.

Report Relating to the Registration of Births, Marriages and Deaths in the Province of Ontario for the year ending 31st December, 1900. Printed by order of the Legislative Assembly of Ontario. 1902. 8vo. 61 + ccxxvi pages. L. K. Cameron, Toronto.

Fifteenth Annual Report of the State Board of Health of the State of Ohio. For the year ending October 31, 1900. 8vo. 603 pages. [1901] Columbus, Ohio.

Psychopathological Researches. Studies in Mental Dissociation. With text figures and ten plates. Boris Sidis, M. A., Ph. D. 1902. 8vo. 329 pages. G. E. Stechert, New York, London, Leipzig, Paris.

Selected Essays and Monographs, Chiefly from English Sources. Braxton Hicks; Bodington; Hodgkin; Paget; Humphry; Ehlers. With Obituary Notice of the Society's Late Treasurer, Dr. Sedgwick Saunders. 1901. 8vo. 325 pages. The New Sydenham Society, London.

The Mental Functions of the Brain. An Investigation into their Localisation and their Manifestation in Health and Disease. By Bernard Hollander, M. D., M. R. C. S., L. R. C. P. (London). Illustrated with the Clinical Records of Eight Hundred Cases of Localised Brain Derangements and with Several Plates. 1901. 8vo. 507 pages. G. P. Putnam's Sons, New York and London.

Gibson and Russell's Physical Diagnosis. Third edition revised and rewritten by Francis D. Boyd, C. M. G., M. D., F. R. C. P. Ed. With 144 illustrations. 1902. 12mo. 448 pages. D. Appleton & Company, New York.

Treatise on Diseases of the Skin. For the Use of Advanced Students and Practitioners. By Henry W. Stelwagon, M. D., Ph. D. With 220 illustrations in the text, and 26 full-page lithographic and half-tone plates. 1902. 8vo. 1115 pages. W. B. Saunders & Company, Philadelphia and London.

A Manual of Instruction in the Principles of Prompt Aid to the Injured. Including a Chapter on Hygiene and the Drill Regulations for the Hospital Corps, U. S. A. Designed for Military and Civil Use. By Alvah H. Doty, M. D. Fourth edition, revised and enlarged. 1902. 12mo. 302 pages. D. Appleton & Company, New York.

Applied Surgical Anatomy. Regionally Presented. For the Use of Students and Practitioners of Medicine. By George Woolsey, A. B., M. D. With 125 illustrations, mostly colored. 1902. 8vo. 521 pages. Lea Brothers & Company, New York and Philadelphia.

A Treatise on Diseases of the Anus, Rectum and Pelvic Colon. By James P. Tuttle, A. M., M. D. With eight colored plates and three hundred and thirty-eight illustrations in the text. 1902. 8vo. 961 pages. D. Appleton & Company, New York.

Diseases of the Stomach. Their Special Pathology, Diagnosis, and Treatment, with Sections on Anatomy, Physiology, Chemical and Microscopical Examination of Stomach Contents, Dietetics, Surgery of the Stomach, etc. By John C. Hemmeter, M. D., Philos. D. With many original illustrations, a number of which are in colors, and a lithograph frontispiece. Third enlarged and revised edition. 1902. 8vo. 894 pages. P. Blakiston's Son & Company, Philadelphia.

The Principles and Practice of Bandaging. By Gwilym G. Davis, M. D. Illustrated from original drawings by the author. 1902. 8vo. 146 pages. P. Blakiston's Son & Company, Philadelphia.

Practical Dietetics. With Special Reference to Diet in Disease. By W. Gilman Thompson, M. D. Second edition, enlarged and thoroughly revised. 1902. 8vo. xxiii + 828 pages. D. Appleton & Company, New York.

Minor Surgery and Bandaging. Including the Treatment of Fractures and Dislocations, the Ligation of Arteries, Amputations, Excisions and Resections, Intestinal Anastomosis, Operations upon Nerves and Tendons, Tracheotomy, Intubation of the Larynx, etc. By Henry R. Wharton, M. D. Fifth edition, enlarged and thoroughly revised, with 509 illustrations. 1902. 12mo. 621 pages. Lea Brothers & Company, Philadelphia and New York.

The Diseases of the Nose, Throat and Ear. By Charles Prevost Grayson, A. M., M. D. Illustrated with 129 engravings and 8 plates in colors and monochrome. 1902. 8vo. 540 pages. Lea Brothers & Company, Philadelphia and New York.

Twenty-fifth Annual Report of the Board of Health of the State of New Jersey and Report of the Bureau of Vital Statistics, 1901. 8vo. 459 pages. 1902. Trenton, New Jersey.

A Guide to the Practical Examination of Urine.—For the Use of Physicians and Students. By James Tyson, M. D. Tenth edition, revised and corrected. With a colored plate and wood engravings. 1902. 12mo. 297 pages. P. Blakiston's Son & Company, Philadelphia.

Die Röntgenstrahlen im Dienste der Chirurgie. Von Dr. Carl Beck. 1902. 8vo. 138 pages. [I. Teil, Text; II. Teil, Tafeln.] Seitz & Schauer, München.

Physical Diagnosis. Diseases of the Thoracic and Abdominal Organs. A Manual for Students and Physicians. By Egbert Le Fevre, M. D. Illustrated with 74 engravings and 12 monochrome plates. 1902. 12mo. 448 pages. Lea Brothers & Company, Philadelphia and New York.

Practical Diagnosis. The Use of Symptoms and Physical Signs in the Diagnosis of Disease. Fifth edition, revised and enlarged. By Hobart Amory Hare, M. D., B. Sc. Illustrated with 236 engravings and 25 plates. 1902. 8vo. 698 pages. Lea Brothers & Company, Philadelphia and New York.

General Paresis. Practical and Clinical. By Robert Howland Chase, A. M., M. D. Illustrated. 1902. 8vo. 291 pages. P. Blakiston's Son & Company, Philadelphia.

The Diseases of Infancy and Childhood. For the Use of Students and Practitioners of Medicine. By L. Emmett Holt, M. D., LL. D. Second edition, revised and enlarged. With two hundred and twenty-five illustrations, including nine colored plates. 1902. 8vo. D. Appleton & Company, New York.

The Diseases of Infancy and Childhood. Designed for the Use of Students and Practitioners of Medicine. By Henry Koplik, M. D. Illustrated with 169 engravings and 30 plates in color and monochrome. 1902. 8vo. 675 pages. Lea Brothers & Company, New York and Philadelphia.

The International Text-book of Surgery. By American and British Authors. Edited by J. Collins Warren, M. D., LL. D., Hon. F. R. C. S. Eng., and A. Pearce Gould, M. S., F. R. C. S. Second edition, thoroughly revised. Volume I, General and Operative Surgery; Volume II, Regional Surgery. 1902. 8vo. W. B. Saunders & Company, Philadelphia and London.

A Text-book of Surgical Principles and Surgical Diseases of the Face, Mouth and Jaws. For Dental Students. By H. Horace Grant, A. M., M. D. Illustrated. 1902. 8vo. 231 pages. W. B. Saunders & Company, Philadelphia and London.

A Text-book of Materia Medica, Therapeutics and Pharmacology. By George Frank Butler, Ph. G., M. D. Fourth edition, thoroughly revised. 1902. 8vo. 896 pages. W. B. Saunders & Company, Philadelphia and London.

The Treatment of Fractures. By Charles Locke Scudder, M. D. Third edition, thoroughly revised. With 645 illustrations. 1902. 8vo. 485 pages. W. B. Saunders & Company, Philadelphia and London.

Essentials of Histology. By Louis Leroy, B. S., M. D. Arranged with Questions following each Chapter. 92 illustrations. Second edition, revised and enlarged. 1902. 12mo. 263 pages. (Saunders' Question-Compends, No. 25.) W. B. Saunders & Company, Philadelphia and London.

Essentials of the Diseases of the Ear. Arranged in the Form of Questions and Answers. Prepared Especially for Students of Medicine and Post-Graduate Students. By E. B. Gleason, S. B., M. D. Third edition, thoroughly revised. 1902. 12mo. 214 pages. (Saunders' Question-Compends, No. 24.) W. B. Saunders & Company, Philadelphia and London.

THE JOHNS HOPKINS HOSPITAL REPORTS.

VOLUME I. 423 pages, 99 plates.

VOLUME II. 570 pages, with 28 plates and figures.

VOLUME III. 766 pages, with 69 plates and figures.

VOLUME IV. 504 pages, 33 charts and illustrations.

Report on Typhoid Fever.

By WILLIAM OSLER, M. D., with additional papers by W. S. THAYER, M. D., and J. HEWETSON, M. D.

Report in Neurology.

Dementia Paralytica in the Negro Race; Studies in the Histology of the Liver; The Intrinsic Pulmonary Nerves in Mammalia; The Intrinsic Nerve Supply of the Cardiac Ventricles in Certain Vertebrates; The Intrinsic Nerves of the Submaxillary Gland of *Mus musculus*; The Intrinsic Nerves of the Thyroid Gland of the Dog; The Nerve Elements of the Pituitary Gland. By HENRY J. BERKLEY, M. D.

Report in Surgery.

The Results of Operations for the Cure of Cancer of the Breast, from June, 1889, to January, 1894. By W. S. HALSTED, M. D.

Report in Gynecology.

Hydrosalpinx, with a report of twenty-seven cases; Post-Operative Septic Peritonitis; Tuberculosis of the Endometrium. By T. S. CULLEN, M. B.

Report in Pathology.

Deciduoma Malignum. By J. WHITRIDGE WILLIAMS, M. D.

VOLUME V. 480 pages, with 32 charts and illustrations.

CONTENTS:

The Malarial Fevers of Baltimore. By W. S. THAYER, M. D., and J. HEWETSON, M. D.

A Study of some Fatal Cases of Malaria. By LEWELLYS F. BARKER, M. B.

Studies in Typhoid Fever.

By WILLIAM OSLER, M. D., with additional papers by G. BLUMER, M. D., SIMON FLEXNER, M. D., WALTER REED, M. D., and H. C. PARSONS, M. D.

VOLUME VI. 414 pages, with 79 plates and figures.

Report in Neurology.

Studies on the Lesions produced by the Action of Certain Poisons on the Cortical Nerve Cell (Studies Nos. I to V). By HENRY J. BERKLEY, M. D.

Introductory.—Recent Literature on the Pathology of Diseases of the Brain by the Chromate of Silver Methods; Part I.—Alcohol Poisoning.—Experimental Lesions produced by Chronic Alcoholic Poisoning (Ethyl Alcohol). 2. Experimental Lesions produced by Acute Alcoholic Poisoning (Ethyl Alcohol); Part II.—Serum Poisoning.—Experimental Lesions induced by the Action of the Dog's Serum on the Cortical Nerve Cell; Part III.—Ricin Poisoning.—Experimental Lesions induced by Acute Ricin Poisoning. 2. Experimental Lesions induced by Chronic Ricin Poisoning; Part IV.—Hydrophobic Toxaemia.—Lesions of the Cortical Nerve Cell produced by the Toxine of Experimental Rabies; Part V.—Pathological Alterations in the Nuclei and Nucleoli of Nerve Cells from the Effects of Alcohol and Ricin Intoxication; Nerve Fibre Terminal Apparatus; Asthenic Bulbar Paralysis. By HENRY J. BERKLEY, M. D.

Report in Pathology.

Fatal Puerperal Sepsis due to the Introduction of an Elm Tent. By THOMAS S. CULLEN, M. B.

Pregnancy in a Rudimentary Uterine Horn. Rupture. Death, Probable Migration of Ovum and Spermatozoa. By THOMAS S. CULLEN, M. B., and G. L. WILKINS, M. D.

Adeno-Myoma Uteri Diffusum Benignum. By THOMAS S. CULLEN, M. B.

A Bacteriological and Anatomical Study of the Summer Diarrhoeas of Infants. By WILLIAM D. BOOKER, M. D.

The Pathology of Toxalbumin Intoxications. By SIMON FLEXNER, M. D.

VOLUME VII. 537 pages with illustrations.

I. A Critical Review of Seventeen Hundred Cases of Abdominal Section from the standpoint of Intra-peritoneal Drainage. By J. G. CLARK, M. D.

II. The Etiology and Structure of true Vaginal Cysts. By JAMES EWING STOKES, M. D.

III. A Review of the Pathology of Superficial Burns, with a Contribution to our Knowledge of the Pathological Changes in the Organs in cases of rapidly fatal burns. By CHARLES RUSSELL BARDEEN, M. D.

IV. The Origin, Growth and Fate of the Corpus Luteum. By J. G. CLARK, M. D.

V. The Results of Operations for the Cure of Inguinal Hernia. By JOSEPH C. BLOODGOOD, M. D.

VOLUME VIII. 552 pages with illustrations.

On the role of Insects, Arachnids, and Myriapods as carriers in the spread of Bacterial and Parasitic Diseases of Man and Animals. By GEORGE H. F. NUTTALL, M. D., PH. D.

Studies in Typhoid Fever.

By WILLIAM OSLER, M. D., with additional papers by J. M. T. FINNEY, M. D., S. FLEXNER, M. D., I. P. LYON, M. D., L. P. HAMBURGER, M. D., H. W. CUSHING, M. D., J. F. MITCHELL, M. D., C. N. B. CAMAC, M. D., N. B. GWYN, M. D., CHARLES P. EMERSON, M. D., H. H. YOUNG, M. D., and W. S. THAYER, M. D.

VOLUME IX. 1060 pages, 66 plates and 210 other Illustrations.

Contributions to the Science of Medicine.

Dedicated by his Pupils to WILLIAM HENRY WELCH, on the twenty-fifth anniversary of his Doctorate. This volume contains 38 separate papers.

VOLUME X. (Nos. 1-2-3-4-5 now ready.)

Structure of the Malarial Parasites. Plate I. By JESSE W. LAZEAR, M. D.

The Bacteriology of Cystitis, Pyelitis and Pyelonephritis in Women, with a Consideration of the Accessory Etiological Factors in these Conditions, and of the Various Chemical and Microscopical Questions Involved. By THOMAS R. BROWN, M. D.

Cases of Infection with Strongyloides Intestinalis. (First Reported Occurrence in North America.) Plates II and III. By RICHARD P. STRONG, M. D. Price in paper, $1.50.

On the Pathological Changes in Hodgkin's Disease with Especial Reference to its Relation to Tuberculosis. Plates IV-VII. By DOROTHY M. REED, M. D.

Diabetes Insipidus with a Report of Five Cases. By THOMAS B. FUTCHER, M. B. (Tor.)

Observations on the Origin and Occurrence of Cells with Eosinophile Granulations in Normal and Pathological Tissues. Plate VIII. By W. T. HOWARD, M. D., and R. G. PERKINS, M. D.

Placental Transmission with Report of a Case during Typhoid Fever. By FRANK W. LYNCH, M. D. Price in paper, $2.25.

The set of ten volumes will be sold for fifty-five dollars, net. Volumes I and II will not be sold separately. Volumes III, IV, V, VI, VII, VIII and X will be sold for five dollars, net, each. Volume IX will be sold for ten dollars, net.

SEPARATE MONOGRAPHS REPRINTED FROM THE JOHNS HOPKINS HOSPITAL REPORTS.

Studies in Dermatology. By T. C. GILCHRIST, M. D., and EMMET RIXFORD, M. D. 1 volume of 164 pages and 41 full-page plates. Price, bound in paper, $2.00.

The Malarial Fevers of Baltimore. By W. S. THAYER, M. D., and J. HEWETSON, M. D. And **A Study of some Fatal Cases of Malaria.** By LEWELLYS F. BARKER, M. B. 1 volume of 280 pages. Price, bound in paper, $2.75.

Pathology of Toxalbumin Intoxications. By SIMON FLEXNER, M. D. 1 volume of 150 pages with 4 full-page lithographs. Price, in paper, $2.00.

Studies in Typhoid Fever. I, II, III. By WILLIAM OSLER, M. D., and others. Extracted from Vols. IV, V and VIII of the Johns Hopkins Hospital Reports. 1 volume of 881 pages. Price, bound in cloth, $5.00.

Orders should be addressed to

The Johns Hopkins Press, Baltimore, Md.

The Johns Hopkins Hospital Bulletins are issued monthly. They are printed by THE FRIEDENWALD CO., Baltimore. Single copies may be procured from Messrs. CUSHING & CO. and the BALTIMORE NEWS CO., Baltimore. Subscriptions, $1.00 a year, may be addressed to the publishers, THE JOHNS HOPKINS PRESS, BALTIMORE, single copies will be sent by mail for fifteen cents each.